MEDICO-CHIRURGICAL SOCIETY
EDINBURGH

V.31

Library
of the
Academy of Medicine
Toronto.
14157

1923

THE TRANSACTIONS

OF THE

MEDICO-CHIRURGICAL SOCIETY

OF EDINBURGH

VOL. XXXI.—NEW SERIES

SESSION 1911-1912

LIBRARY
NOV 2 9 2000
UNIVERSITY OF TORONTO

1912

Printed for the Society by
TURNBULL & SPEARS

JAMES THIN, PUBLISHER TO THE SOCIETY
Edinburgh

PREFACE

THE present Volume is the *Thirty-first* of the *New Series*, and contains a record of the work done during the past Session.

That work, as hitherto, embraces the communication of Original Papers; the exhibition of Patients, illustrating rare and interesting forms of disease; and the exhibition of Pathological and other Specimens, so essential to the proper understanding of the morbid changes which take place in the human body.

Nine meetings were held in the year, one of them being a clinical meeting.

CHALMERS WATSON,
Editor.

October 1912.

Medico-Chirurgical Society of Edinburgh.

INSTITUTED 2ND AUGUST 1821.

OFFICE-BEARERS FOR SESSION 1911-1912.

PRESIDENT.

JOSEPH MONTAGU COTTERILL, M.B., P.R.C.S. Ed.

VICE-PRESIDENTS.

CHARLES WALKER CATHCART, M.B., F.R.C.S. Eng. & Ed.
JOHN PLAYFAIR, M.D., F.R.C.P. Ed., Hon. F.R.C.S. Ed.
ALEXANDER JAMES, M.D., F.R.C.P. Ed.

TREASURER.

JOHN WHEELER DOWDEN, M.B., F.R.C.S. Ed., 48 Manor Place.

SECRETARIES.

ALEXANDER MILES, M.D., F.R.C.S. Ed., 20 Walker Street.
JAMES STEWART FOWLER, M.D., F.R.C.P. Ed.

EDITOR OF TRANSACTIONS.

CHALMERS WATSON, M.D., F.R.C.P. Ed., 11 Walker Street.

MEMBERS OF COUNCIL.

THOMAS JACKSON THYNE, M.B., F.R.C.P. Ed.
EDWIN BRAMWELL, M.B., F.R.C.P. Eng. & Ed.
JOHN WILLIAM STRUTHERS, M.B., F.R.C.S. Ed.
ROBERT JOHN JOHNSTON, M.B., C.M.
GEORGE HUNTER, M.D., F.R.C.S. Ed., F.R.C.P. Ed.
JAMES RITCHIE (*Secundus*), M.D.
FRANCIS DARBY BOYD, C.M.G., M.D., F.R.C.P. Ed.
GEORGE LYALL CHIENE, M.B., F.R.C.S. Ed.

LIST of Presidents, Vice-Presidents, Treasurers, Secretaries, and Editors of Transactions of the Society.

PRESIDENTS.

Note.—The Presidents continue in office two years.

Dr Duncan, Sen.,	1821	Dr Robert Omond,	1867
James Russell, Esq.,	1823	Dr Bennett,	1869
Dr John Thomson,	1825	Dr Handyside,	1871
Dr Kellie,	1827	Dr Haldane,	1873
Dr Abercrombie,	1829, 1831	Dr Gillespie,	1875
Dr Alison,	1833	Dr Sanders,	1877
Sir Robert Christison, Bart.,	1835	Sir Patrick Heron Watson,	1879
William Wood, Esq.,	1837, 1839	Dr G. W. Balfour,	1881
Dr Maclagan,	1840	Sir Henry D. Littlejohn,	1883
Dr Graham,	1842	Sir T. Grainger Stewart,	1885
Dr Gairdner,	1844	Dr John Smith,	1887
Dr R. Hamilton,	1846	Sir Alexander R. Simpson,	1889
James Syme, Esq.,	1848	Dr Joseph Bell,	1891
Dr Begbie,	1850	Sir T. S. Clouston,	1893
Sir J. Y. Simpson, Bart.,	1852	Dr Argyll Robertson,	1895
Dr Seller,	1854	Sir J. Batty Tuke,	1897
James Miller, Esq.,	1856	A. Gordon Miller, Esq.,	1899
John Goodsir, Esq.,	1858	Sir Thomas R. Fraser,	1901
Benjamin Bell, Esq.,	1859	Prof. John Chiene, C.B.,	1903
James Spence, Esq.,	1861	Sir J. O. Affleck,	1905
Sir Douglas Maclagan,	1863	Dr James Ritchie,	1907
Dr John Moir,	1865	Dr Byrom Bramwell,	1909

VICE-PRESIDENTS.

Note.—The Vice-Presidents continue in office three years.

Dr James Home,	1821	Sir Alexander R. Simpson,	1879
James Russell, Esq.,	1821	Joseph Bell, Esq.,	1880
Dr John Thomson,	1821	Sir Thomas R. Fraser,	1881
Dr John Abercrombie,	1822, 1825	Dr David Wilson,	1882
Dr Andrew Duncan, Jr.,	1823, 1826	Sir J. Batty Tuke,	1883
Dr George Kellie,	1824	Dr John Duncan,	1884
Dr David Maclagan,	1827	Dr R. Peel Ritchie,	1885
Sir Robert Christison, Bart.,	1833	Professor John Chiene, C.B.,	1886
William Brown, Esq.,	1839, 1843	Sir T. S. Clouston,	1887
Sir Douglas Maclagan,	1850, 1862	A. G. Miller, Esq.,	1888
Dr Combe,	1851	Dr D. J. Brakenridge,	1889
Dr Omond,	1854, 1866	Dr Peter H. M'Laren,	1890
Benjamin Bell, Esq.,	1856	Dr Claud Muirhead,	1891
James Spence, Esq.,	1857	Dr R. J. Blair Cunynghame,	1892
Dr Charles Wilson,	1858	Dr John Wyllie,	1893
Dr Inglis,	1859	Dr William Craig,	1894
Sir W. T. Gairdner,	1861	Dr James Carmichael,	1895
Dr Andrew Wood,	1862	Dr Francis Cadell,	1896
Dr P. D. Handyside,	1863	Dr P. A. Young,	1897
Dr Rutherford Haldane,	1864	Dr James Dunsmure,	1898
Dr J. D. Gillespie,	1865	Dr James Andrew,	1899
Dr Halliday Douglas,	1867	Dr C. E. Underhill,	1900
Dr W. R. Sanders,	1867	Dr James Ritchie,	1901
Dr Thomas Keith,	1868	Sir James O. Affleck,	1902
Dr Matthews Duncan,	1869	Sir J. Halliday Croom,	1903
Lord Lister,	1870	Professor W. S. Greenfield,	1904
Dr R. Paterson,	1871	Dr Byrom Bramwell,	1905
Sir Patrick Heron Watson,	1872	Dr George Hunter,	1906
Dr G. W. Balfour,	1873	Dr C. W. MacGillivray,	1907
Sir Henry D. Littlejohn,	1874	Dr W. Allan Jamieson,	1908
Dr Keiller,	1875	J. M. Cotterill, Esq.,	1908
Dr Argyll Robertson,	1876	C. W. Cathcart, Esq.,	1910
Sir T. Grainger Stewart,	1877	Dr J. Playfair,	1911
Thomas Annandale, Esq.,	1878	Dr A. James,	1911

TREASURERS.

Note.—The Treasurer, Secretaries, and Editor of Transactions are elected annually.

James Bryce, Esq.,	1821 to 1826	A. G. Miller, Esq.,	1880 to 1888
Dr Gairdner,	1826 to 1843	Dr Francis Troup,	1888 to 1892
Dr Omond,	1843 to 1854	Dr R. M'Kenzie Johnston,	1892 to 1899
Sir John Struthers,	1854 to 1863	Dr Harvey Littlejohn,	1899 to 1906
Dr George W. Balfour,	1863 to 1872	J. Wheeler Dowden, Esq.,	1906
Joseph Bell, Esq.,	1872 to 1880		

SECRETARIES.

Dr Alison,	1821 to 1823	Dr Cadell,	1877 to 1881
Dr R. Hamilton,	1821 to 1830	Dr Brakenridge,	1879 to 1882
Dr J. C. Gregory,	1830 to 1833	Dr MacGillivray,	1881 to 1885
William Brown, Esq.,	1833 to 1839	Dr James,	1882 to 1886
Dr W. Thomson,	1833 to 1840	C. W. Cathcart, Esq.,	1885 to 1888
Sir Douglas Maclagan,	1839 to 1864	Dr James Ritchie,	1886 to 1890
Dr James Duncan,	1840 to 1845	Francis M. Caird, Esq.,	1888 to 1892
Dr John Taylor,	1846 to 1851	Dr William Russell,	1890 to 1894
Dr J. H. Bennett,	1846 to 1848	J. W. B. Hodsdon, Esq.,	1892 to 1896
Dr Wm. Robertson,	1848 to 1851	Dr George A. Gibson,	1894 to 1895
Sir W. T. Gairdner,	1851 to 1857	Dr J. J. Graham Brown,	1895 to 1899
Dr J. W. Begbie,	1852 to 1858	J. M. Cotterill, Esq.,	1896 to 1901
Dr J. D. Gillespie,	1857 to 1864	Dr H. Melville Dunlop,	1899 to 1903
Sir Patrick H. Watson,	1858 to 1867	Alexis Thomson, Esq.,	1901 to 1905
Dr Dycer,	1864 to 1867	Dr G. Lovell Gulland,	1903 to 1907
Sir T. Grainger Stewart,	1867 to 1870	D. Wallace, Esq., C.M.G.,	1905 to 1909
Dr Argyll Robertson,	1867 to 1872	Dr F. D. Boyd, C.M.G.,	1907 to 1911
Dr Muirhead,	1870 to 1876	Alexander Miles, Esq.,	1909
John Chiene, Esq., C.B.,	1872 to 1877	Dr J. Stewart Fowler,	1911
Dr Wyllie,	1876 to 1879		

EDITORS OF TRANSACTIONS.

Dr William Craig,	1882 to 1909
Dr Chalmers Watson,	1909

HONORARY MEMBERS.

Professor Theodor Kocher, M.D., LL.D., Bern,	1895
John S. Billings, M.D., LL.D., 40 Lafayette Place, New York,	1895
Sir Thomas Lauder Brunton, M.D., LL.D., F.R.S., F.R.C.P.L., 10 Stratford Place, London, W.,	1900
Professor William Osler, M.D., LL.D., F.R.S., F.R.C.P., University of Oxford,	1900
Principal Sir William Turner, K.C.B., D.C.L., LL.D., D.Sc., F.R.S., F.R.C.S. Ed., 6 Eton Terrace,	1903
Wilhelm Konrad Röntgen, Professor of Experimental Physics, University of Munich,	1905
Professor P. Ehrlich, Frankfort-on-the-Maine,	1906
John Hughlings Jackson, M.D., LL.D., F.R.S., F.R.C.P. Lond., 3 Manchester Square, London, W.,	1908
Professor Elie Metchnikoff, Institut Pasteur, 16 Rue de la Sorbonne, Paris,	1909

FOREIGN CORRESPONDING MEMBERS.

Dr Edmund Hansen Grut, Copenhagen, . . . 1877
Dr D. B. St John Roosa, New York, 1877
Prof. Stricker, Vienna, . . 1878
Dr Wortabet, Beyrout, . . 1879
Prof. Hegar, Freiburg, . . 1880
Prof. Albert, Vienna, . . 1880
Dr J. Lucas-Championnière, Paris, 1882
Prof. François Franck, Paris, . 1883
Prof. R. Lépine, Lyons, . . 1883
Prof. Henri Huchard, Paris, . 1902
Prof. Fritz Strassmann, Siegmundshop 18a, Berlin, . 1903
Prof. R. H. Babcock, Chicago, U.S.A., ... 1904
Prof. D. D. Stewart, Philadelphia, 1904
Prof. K. F. Wenckebach, The University, Groningen, Holland, 1904
Ivan P. Pavloff, St Petersburg, 1908
Francis J. Shepherd, F.R.C.S. Ed., Montreal, . . . 1908
Dr C. F. Martin, Professor of Clinical Medicine, M'Gill University, Montreal, . . 1909
Dr L. F. Barker, Professor of Medicine, Johns Hopkins University, Baltimore, . . 1909
Dr A. M'Phedran, Montreal, . 1910
Dr F. C. Shattuck, Professor of Clinical Medicine, Harvard University, ... 1912

CORRESPONDING MEMBERS IN THE UNITED KINGDOM.

Frederick William Pavy, M.D., LL.D., F.R.C.P. Lond., F.R.S., 35 Grosvenor Street, London, W., ... 1869
David Lloyd Roberts, M.D., F.R.C.P. Lond., F.R.S.E., 11 St John's St., Manchester, ... 1869
Sir Samuel Wilks, Bart., M.D., LL.D., F.R.C.P. Lond., F.R.S., 8 Prince Arthur Road, Hampstead, London, N.W., . . . 1869
Robert Brudenell Carter, F.R.C.S. Eng., 76 South Side, Clapham Common, London, S.W., ... 1877
Professor Sir William Macewen, M.D., LL.D., F.F.P. & S. Glasg., F.R.S., 3 Woodside Crescent, Charing Cross, Glasgow, . . 1896
Sir Henry Rosborough Swanzy, M.B., F.R.C.S.I., 23 Merrion Square, North, Dublin, ... 1908
W. Watson Cheyne, C.B., LL.D., F.R.C.S., F.R.S., . . . 1910
Sir Thomas Clifford Allbutt, K.C.B., LL.D., M.D., F.R.S., . . 1910

ORDINARY MEMBERS.

ARRANGED CHRONOLOGICALLY.

Note.—Those marked with an asterisk have been Members of Council. Members of Council continue in office for two years.

(*a*) Members who pay the Annual Subscription.

		Date of Admission.
**	Emeritus Professor Sir Henry Duncan Littlejohn, M.D., LL.D., F.R.C.S. Ed., ...	1853
**	Emeritus Professor Sir Alexander Russell Simpson, M.D., LL.D., F.R.C.P. Ed., ...	1859
**	Sir Thomas Smith Clouston, M.D., LL.D., F.R.C.P. Ed., .	1861
***	Sir John Batty Tuke, M.P., M.D., LL.D., F.R.C.P. Ed., .	1864
**	Professor Sir Thomas Richard Fraser, M.D., LL.D., D.Sc., F.R.C.P. Ed., ...	1865
**	Alexander Gordon Miller, M.D., F.R.C.S. Ed., . .	1867
**	Emeritus Professor John Chiene, C.B., M.D., LL.D., D.Sc., F.R.C.S. Ed., ...	1867
*	John Strachan, M.D., *Dollar*, ...	1867
*	Professor John Wyllie, M.D., LL.D., F.R.C.P. Ed., .	1868
*	William Craig, M.D., F.R.C.S. Ed., . . .	1869
*	James Carmichael, M.D., F.R.C.P. Ed., . . .	1870
*	Professor Sir John Halliday Croom, M.D., F.R.C.S. Ed., F.R.C.P. Ed., ...	1870

			Date of Admission.
	*	William Taylor, M.D., F.R.C.P. Ed.,	1871
	**	Sir James Ormiston Affleck, M.D., LL.D., F.R.C.S. Ed., F.R.C.P. Ed.,	1871
15	**	James Ritchie, M.D., F.R.C.P. Ed., F.R.C.S. Ed.,	1873
	*	John Playfair, M.D., F.R.C.P. Ed., Hon. F.R.C.S. Ed., *Vice-President*,	1874
	*	Byrom Bramwell, M.D., F.R.C.S. Ed., F.R.C.P. Ed.	1876
	*	Henry Macdonald Church, M.D., F.R.C P. Ed.,	1876
	*	Charles H. Thatcher, F.R.C.S. Ed.,	1876
20	*	William Allan Jamieson, M.D., P.R.C.P. Ed.	1876
	***	George Hunter, M.D., F.R.C.S. Ed., F.R.C.P. Ed.,	1876
	*	Charles Watson MacGillivray, M.D., F.R.C.S. Ed.,	1877
	*	John Brown Buist, M.D., F.R.C.P. Ed.,	1877
	**	Alexander James, M.D., F.R.C.P. Ed., *Vice-President*,	1877
25	*	Thomas Rutherford Ronaldson, M.B., F.R.C.P. Ed.,	1877
	*	David Menzies, M.B., F.R.C.S. Ed.,	1878
	*	Joseph Montagu Cotterill, M.B., F.R.C.S. Ed., *President*,	1878
	**	John James Graham Brown, M.D., F.R.C.P. Ed.,	1878
		John Fraser, M.B., F.R.C.P. Ed.,	1878
30	*	James Allan Gray, M.D., F.R.C.P. Ed., *Leith*,	1879
	**	George Alexander Gibson, M.D., LL.D., F.R.C.P. Ed.,	1880
	*	Alexander Hugh Freeland Barbour, M.D., F.R.C.P. Ed.,	1881
	*	Professor Francis Mitchell Caird, M.B., F.R.C.S. Ed.,	1883
	*	Robert Henry Blaikie, M.D., F.R.C.S. Ed.,	1883
35	*	Charles Walker Cathcart, M.B., F.R.C.S. Eng. & Ed., *Vice-President*,	1883
		John Lyon Wilson, L.R.C.P. Ed.,	1883
	*	Russell Eliott Wood, M.B., F.R.C.S. Ed.,	1883
	*	James William Beeman Hodsdon, M.D., F.R.C.S. Ed.,	1883
	*	Robert Alexander Lundie, M.B., B.Sc., F.R.C.S. Ed.,	1883
40	**	Harry Melville Dunlop, M.D., F.R.C.P. Ed.,	1883
	**	George Andreas Berry, M.B., F.R.C.S. Ed.,	1883
	*	Arthur Douglas Webster, M.D., F.R.C.P. Ed.,	1883
	*	Robert William Philip, M.D., F.R.C.P. Ed.,	1883
	**	William Russell, M.D., F.R.C.P. Ed.,	1884
45	*	Hugh Logan Calder, M.D., F.F.P. & S. Glasg., *Leith*,	1884
		Thomas Goodall Nasmyth, M.D., F.R.C.S. Ed., D.Sc.,	1884
		John Mowat, M.D., C.M.,	1885
	*	Michael Dewar, M.D., C.M.,	1885
		John Struthers Stewart, L.R.C.P. & S. Ed.,	1885
50	*	Allen Thomson Sloan, M.D., C.M.,	1885
	*	John William Ballantyne, M.D., F.R.C.P. Ed.,	1885
	*	George Kerr, M.B., C.M.,	1885
		James Haig Ferguson, M.D., F.R.C.P. Ed., M.R.C.S. Eng.,	1885
		James Mill, M.B., F.R.C.P. Ed., *Leith*,	1886
55	*	Thomas M. Burn-Murdoch, M.B., F.R.C.P. Ed.,	1886
		Emeritus Professor William Smith Greenfield, M.D., F.R.C.P. Lond. and Ed.,	1886
		Nathaniel Thomas Brewis, M.B., F.R.C.P. Ed., F.R.C.S. Ed.,	1886
		David Berry Hart, M.D., F.R.C.P. Ed.,	1886
		Robert S. Aitchison, M.D., F.R.C.P. Ed.,	1887
60	*	John Thomson, M.D., F.R.C.P. Ed.,	1887
	*	Thomas Brown Darling, M.D., C.M.,	1887
	*	Edward Carmichael, M.D., F.R.C.P. Ed.,	1887
	*	George Mackay, M.D., F.R.C.S. Ed., M.R.C.S. Eng.,	1887
	**	Professor Henry Alexis Thomson, M.D., F.R.C.S. Ed.,	1887
65	**	David Wallace, C.M.G., M.B., F.R.C.S. Ed.,	1887
		William Booth, F.R.C.S. Ed.,	1888
		George Minto Johnston, M.D., F.R.C.P. Ed., *Leith*,	1888
		George Pirrie Boddie, M.B., C.M.,	1888
	*	Kenneth Mackinnon Douglas, M.D., F.R.C.S. Ed.,	1888
70	**	George Lovell Gulland, M.D., F.R.C.P. Ed.,	1888

		Date of Admission.
	William Haldane, M.D., F.R.C.P. Ed., *Bridge of Allan*,	1889
	* Harold Jalland Stiles, M.B., F.R.C.S. Ed.,	1889
	* Professor Henry Harvey Littlejohn, M.B., F.R.C.S. Ed.,	1889
	* William George Sym, M.D., F.R.C.S. Ed.,	1889
75	Hugh Jamieson, M.D., C.M.,	1889
	* G. Keppie Paterson, M.B., F.R.C.P. Ed.,	1889
	* William Stewart, M.D., F.R.C.S. Ed., F.F.P. & S. Glasg., *Leith*,	1889
	Thomas Proudfoot, M.B., F.R.C.P. Ed.,	1889
	* Dawson Fyers Duckworth Turner, M.D., F.R.C.P. Ed.,	1890
	Edward Farr Armour, M.B., C.M.,	1890
	* William Guy, F.R.C.S. Ed.,	1890
	* Robert A. Fleming, M.D., F.R.C.P. Ed.,	1890
	* Robert Thin, M.B., F.R.C.P. Ed.,	1890
	* George Matthew Robertson, M.D., F.R.C.P. Ed.,	1890
85	A. Cowan Guthrie, M.B., C.M., *Leith*,	1890
	* Francis Darby Boyd, C.M.G., M.D., F.R.C.P. Ed.,	1891
	* John Macpherson, M.D., F.R.C.P. Ed.,	1891
	James Smith, M.D., C.M.,	1891
	* Norman Purvis Walker, M.D., F.R.C.P. Ed.,	1891
90	* Alexander Miles, M.D., F.R.C.S. Ed., *Secretary*,	1892
	Robert Abernethy, M.D., F.R.C.P. Ed.,	1892
	* Arthur Logan Turner, M.D., F.R.C.S. Ed.,	1892
	G. Matheson Cullen, M.D., C.M.,	1892
	* William George Aitchison Robertson, M.D., F.R.C.P. Ed.,	1892
95	John Stevens, M.D., F.R.C.P. Ed.,	1892
	* James Crawfurd Dunlop, M.D., F.R.C.P. Ed., M.R.C.S. Eng.,	1892
	* William Elder, M.D., F.R.C.P. Ed., *Leith*,	1892
	David M. Greig, Esq., M.B., C.M., F.R.C.S. Ed.,	1892
	Robert Stewart, M.B., C.M.,	1892
100	John MacRae, M.D., C.M., *Murrayfield*,	1893
	James Harvey, M.D., C.M.,	1893
	Henry Anderson Peddie, M.B., C.M.,	1893
	John Wheeler Dowden, M.B., F.R.C.S. Ed., *Treasurer*,	1893
	Alexander Bruce Giles, M.D., C.M.,	1893
105	William Basil Orr, M.D., C.M.,	1893
	William Ford Robertson, M.D., C.M.,	1893
	Philip G. Borrowman, M.D., C.M.,	1893
	Frederick Maurice Graham, F.R.C.S. Ed., L.R.C.P. Ed.,	1894
	* Claude B. Ker, M.D., F.R.C.P. Ed.,	1894
110	* John Cumming, M.D., F.R.C.S. Ed., F.R.C.P. Ed.,	1894
	Charles E. Douglas, M.D., C.M., *Cupar-Fife*,	1894
	* Chalmers Watson, M.D., F.R.C.P. Ed., *Editor of Transactions*,	1894
	James Cameron, M.D., C.M.,	1895
	Robert Miller Ronaldson, M.D., F.R.C.P. Ed., M.R.C.S. Eng.,	1895
115	James Scott, M.D., C.M.,	1895
	John Orr, M.D., F.R.C.P. Ed.,	1895
	John Hossack Fraser, M.B., F.R.C.P. Ed., *Bridge of Allan*,	1895
	James Gibson Cattanach, M.B., F.R.C.P. Ed.,	1895
	* James Stewart Fowler, M.D., F.R.C.P. Ed., *Secretary*,	1895
120	Ernest George Salt, L.R.C.P. & S. Ed.,	1895
	John Tod, M.B., C.M., *Leith*,	1895
	William Henry Miller, M.D., F.R.C.P. Ed.,	1895
	Robert Willisforce Inkster, M.D., C.M.,	1895
	William Leslie Mackenzie, M.D., C.M.,	1895
125	John Adamson Henry Duncan, M.D., C.M.,	1895
	John Comrie Smith, M.B., C.M.,	1896
	Harry Rainy, M.D., F.R.C.P. Ed.,	1896
	Frederick John Turnbull, L.R.C.P. & S. Ed.,	1896
	Robert Durward Clarkson, M.D., C.M.,	1896

			Date of Admission.
130	*	Archibald Adam Scot Skirving, C.M.G., M.B., F.R.C.S. Ed., M.R.C.S. Eng..	1897
	*	Theodore Shennan, M.D., F.R.C.S. Ed., . . .	1897
		John Macmillan, D.Sc., M.D., F.R.C.P. Ed.. . .	1897
		David James Graham, M.D., F.R.C.P. Ed., . . .	1897
	*	Robert John Johnston, M.B., C.M., ...	1897
135		Alexander Cruickshank Ainslie, M.D., C.M., . .	1898
	*	Thomas Jackson Thyne, M.B.. F.R.C.P. Ed., . .	1898
		James Taylor Grant, M.D., C.M., ...	1898
		Henry Alfred Leebody, M.B., C.M., *Corstorphine*, . .	1899
		Harold Sherman Ballantyne, M.B., M.R.C.P. Ed., *Dalkeith*,	1899
140		Alexander Hill Buchan, M.B., C.M., . . .	1899
		David Huskie, M.B., C.M., *Moffat*, ...	1899
		Hamilton Graham Langwell, M.D., F.R.C.P. Ed., . .	1899
		John M'Gibbon, Junr., M.B., Ch.B., . . .	1899
		Frederick Gardiner, M.D., C.M., ...	1900
145	*	Edwin Bramwell, M.B., M.R.C.P. Ed., . . .	1900
		John William Steven, M.B., F.R.C.S. Ed., . . .	1900
		Harry Oliphant Nicholson, M.D., F.R.C.P. Ed., . .	1900
		John Craig, M.B., Ch.B., ...	1900
		John Boyd Jamieson, M.D., F.R.C.S. Ed., . . .	1900
150		William Cameron Sillar, M.D., B.Sc., . . .	1900
		Malcolm M'Larty, M.B., C.M., ...	1900
		James Wilson, M.B., C.M., ...	1900
		John Thomas Dickie, L.R.C.P. and S. Ed., . . .	1900
		George Freeland Barbour Simpson, M.D., F.R.C.S. Ed., F.R.C.P. Ed., ...	1900
155		Arthur Henry Havens Sinclair, M.D., F.R.C.S. Ed., .	1900
		John Eason, M.D., F.R.C.P. Ed., ...	1900
		Henry Torrance Thomson, M.D., C.M., . . .	1900
		James Veitch Paterson, M.B., F.R.C.S. Ed., . .	1900
		Donald Campbell Archibald M'Allum, M.B., C.M., . .	1900
160		William Thomas Ritchie, M.D., F.R.C.P. Ed., . .	1900
		Edwin Matthew, M.D., F.R.C.P. Ed., *Leith*, . .	1900
		William Blakely Drummond, M.B., F.R.C.S. Eng., F.R.C.P. Ed ,	1900
		David Lawson, M.D., *Banchory*, ...	1901
	*	George Lyall Chiene, M.B., F.R.C.S. Ed., . . .	1901
165		Alexander Dingwall Fordyce, M.D., F.R.C.P. Ed., . .	1901
		George Dickson, M.D., C.M..	1901
		John William Simpson, M.D., C.M., ...	1901
		Augustus Alexander Matheson, M.D.. F.R.C.P. Ed., .	1901
	*	John William Struthers, M.B., F.R.C.S. Ed., . .	1901
170		Edwin Malcolm Lithgow, M.B., C.M., . . .	1901
		John Davis Lithgow, M.D., F.R.C.S. Ed., . . .	1901
		James Kennedy Drysdale, M.B., C.M., . . .	1901
		Edward William Scott Carmichael, M.B., F.R.C.S. Ed., .	1901
		Robert Robertson, M.B., C.M., ...	1901
175		John Macaulay Bowie, M.D., F.R.C.S., M.R.C.P., . .	1901
		Alexander Goodall, M.D., F.R.C.P. Ed., . . .	1901
		George James Rogerson Carruthers, M.B., Ch.B., . .	1901
		William Robertson, M.D., D.P.H., *Leith*, . . .	1902
		Charles Mowbray Pearson, M.B., F.R.C.P. Ed., . .	1902
180		Angus Macdonald, M.B., F.R.C.S. Ed., . . .	1902
		Archibald Nathaniel Shirley Carmichael, M.B., C.M.. .	1902
		William Leslie Lyall, M.B., C.M., ...	1902
		William James Stuart, M.B., Ch.B., ...	1902
		Alexander Aitken Ross, M.B., C.M., ...	1902
185		John Dixon Comrie, M.B., M.R.C.P. Ed., . . .	1902
		Roderick Murdoch Matheson, M.D., F.R.C.S. Ed., . .	1902
		Walter de Watteville, M.D., C.M., *Kingussie*, . .	1902
		Norman Lang Stevenson, L.R.C.P. Ed., L.R.C.S. & L.D.S. Ed.,	1902
		William Elliot Carnegie Dickson, M.D., Ch.B., . .	1902

		Date of Admission.
190	George Scott Carmichael, M.B., Ch.B.,	1903
	William Macrae Taylor, M.B., F.R.C.S. Ed.,	1903
	Henry Wade, M.D., F.R.C.S. Ed.,	1903
	Thomas Finlay, M.B., C.M.,	1903
	Andrew Binny Flett, M.B., Ch.B.,	1903
195	Alexander Morrison MacIntosh, M.B., Ch.B.,	1904
	George Thyne, M.B., C.M.,	1904
	George William Simla Paterson, M.B., C.M.,	1904
	Frederick Porter, M.B., C.M.,	1904
	Douglas M'Rae, M.D., *Ayr*,	1904
200	William Ernest Frost, M.B., Ch.B.,	1904
	John Ligertwood Green, M.D., Ch.B.,	1904
	Cuthbert Balfour Paul, M.B., F.R.C.S. Ed.,	1904
	Lionel Charles Peel Ritchie, M.D., F.R.C.S. Ed.,	1904
	John Herbert Gibbs, F.R.C.S. Ed., L.D.S.,	1905
205	William Morrison Milne, M.B., F.R.C.S. Ed.,	1905
	Lewis Beesley, F.R.C.S. Ed., L.R.C.P. Ed.,	1905
	Andrew Fleming, M.B., Ch.B., *Corstorphine*,	1905
	John Smith Fraser, M.B., F.R.C.S. Ed.,	1905
	Alexander Mowatt Malcolmson, M.D., Ch.B., *Corstorphine*,	1905
210	Daniel Grove Marshall, M.B., C.M.,	1905
	James Hunter Harvie Pirie, M.D., Ch.B.,	1905
	Frederick David Simpson, M.D., F.R.C.S. Ed.,	1905
	Douglas G. Reid, M.B.,	1905
	David Macquhorne-Rankine Crichton, M.B., C.M., *Maryhill*,	1906
215	James Andrew Gunn, M.D., Ch.B.,	1906
	Thomas William Dewar, M.D., F.R.C.P. Ed., *Dunblane*,	1906
	David Halliday Croom, M.D., Ch.B.,	1906
	George Augustus Davies, M.D., Ch.B., *Musselburgh*,	1906
	David Elliot Dickson, M.B., C.M., *Lochgelly*,	1906
220	Robert Cranston Low, M.D., F.R.C.P. Ed.,	1906
	John Halley Meikle, M.D., D.P.H., C.M.,	1906
	Ian Struthers Stewart, M.D., Ch.B.,	1906
	Robert William Johnstone, M.D., F.R.C.S. Ed.,	1907
	William Edward Foggie, M.B., C.M., *Dundee*,	1907
225	William Guthrie Porter, M.B., F.R.C.S. Ed.,	1907
	Alexander Walker, M.D., C.M.,	1907
*	James Ritchie, M.D.,	1907
	Arthur John Brock, M.D., Ch.B.,	1907
	James Burnet, M.D., M.R.C.P. Ed.,	1907
230	William Fordyce, M.D., F.R.C.P. Ed.,	1907
	James Lamond Lackie, M.D., F.R.C.P. Ed.,	1907
	Peterswald Pattison, M.B., Ch.B., *Kirkwally*,	1907
	Arthur Murray Wood, M.D., D.P.H., *Leith*,	1907
	Robert Dods Brown, M.D., M.R.C.P. Ed.,	1908
235	Alexander Waddell Greenhorn Clark, M.B., C.M.,	1908
	James Methuen Graham, M.B., F.R.C.S. Ed.,	1908
	William James Crow, M.B., Ch.B.,	1908
	Kenmure Melville, M.D., Ch.B.,	1908
	John Stuart Ross, M.B., F.R.C.S. Ed.,	1908
240	William Paterson, M.B., C.M., *Leith*,	1909
	Edmond Frederick Tanney Price, M.B., C.M.,	1909
	Dennis Cotterill, M.B., Ch.B.,	1909
	David Percival Dalbreck Wilkie, M.D., F.R.C.S. Ed.,	1909
	Alexander Dun, F.R.C.S.E.,	1909
245	Archibald M'Kendrick, F.R.C.S.,	1909
	Charles M'Neil, M.A., M.D.,	1909
	Hugh Smith Reid, M.D., F.R.C.S.,	1910
	Francis Kenneth Kerr, M.B., Ch.B.,	1910
	George Laurence, M.B., C.M.,	1910
250	N. Scott Carmichael, M.B., Ch.B.,	1910
	A. E. Chisholm, M.B., Ch.B.,	1910

		Date of Admission.
	H. M. Traquair, F.R.C.S.,	1910
	James Miller, M.D.,	1910
	L. H. F. Thatcher, M.B., Ch.B.,	1910
255	G. Fyfe, M.B., Ch.B.,	1911
	Frank E. Jardine, M.B., Ch.B., *Penicuik*,	1911
	Archibald Mackintosh, M.B., C.M.,	1911
	John H. H. Pearson, M.B., Ch.B.,	1911
	George D. Mathewson, M.B., B.Sc., M.R.C.P. Ed.,	1911
260	William Henderson Bryce, M.B., C.M., *Colinsburgh, Fife*,	1911
	John Alexander Gray, M.B., Ch.B.,	1911
	James Lochhead, M.D., F.R.C.S. Ed.,	1911
	A. Pirie Watson, M.B., Ch.M., F.R.C.S. Ed.,	1911
	H. L. Watson-Wemyss, M.D., M.R.C.P. Ed.,	1911
265	John Fraser, M.B., Ch.B., F.R.C.S. Ed.,	1911
	A. Fergus Hewat, M.B., Ch.B., M.R.C.P. Ed.,	1911
	Thomas James Thomson, M.D.,	1911
	R. S. Mowat, M.D.,	1912
	James Young, M.D.,	1912

(*b*) Members Exempted under Rule V. from paying the Annual Subscription.

270	W. Judson Van Someren, M.D., L.R.C.S. Ed., *Northwood*,	1845
	George Skene Keith, M.D., LL.D., F.R.C.P. Ed., *Currie*,	1845
	Archibald Hall, M.D., *Montreal*,	1853
	Horatio Robinson Storer, M.D., *Newport, Rhode Island, U.S.*,	1855
	Professor William Stephenson, M.D., F.R.C.S. Ed., *Aberdeen University*,	1861
275	J. S. Beveridge, M.R.C.P. Lond., F.R.C.S. Ed., *Melton Constable*,	1861
	David Yellowlees, M.D., LL.D., F.F.P. & S. Glasg., *Glasgow*,	1862
	John Linton, M.D., F.R.C.P. Ed., *Aberdour*,	1863
	Professor John Cleland, M.D., LL.D., *The University, Glasgow*,	1864
	Right Hon. Sir R. B. Finlay, M.D., LL.D., K.C., *Middle Temple, London*,	1864
280	Stanley Lewis Haynes, M.D., M.R.C.S. Eng., *Malvern*,	1864
	Peter Orphoot, M.D., *North Berwick*,	1865
	James Watt Black, M.D., F.R.C.P.L., *London*,	1865
	Robert Shand Turner, M.D., C.M., *Keith*,	1867
	Peter Maury Deas, M.B., L.R.C.S. Ed., *Exeter*,	1868
285	Professor J. G. M'Kendrick, M.D., LL.D., F.R.C.P. Ed., *Stonehaven*,	1870
	James Johnston, M.D., F.R.C.S. Ed., *London*,	1871
	J. William Eastwood, M.D., M.R.C.P.L., *Oxford*,	1871
	Alexander Ballantyne, M.D., F.R.C.P. Ed., *Dalkeith*,	1872
	* Professor J. Bell Pettigrew, M.D., LL.D., F.R.C.P. Ed., *University of St Andrews*,	1873
290	John Aymers Macdougall, M.D., F.R.C.S. Ed., *France*,	1875
	* Dr Groesbeck, *Cincinnati*,	1875
	James Stitt Thomson, M.D., F.R.C.P. Ed., F.R.C.S. Ed., *Lincoln*,	1877
	George Herbert Bentley, L.R.C.P. & S. Ed., *Kirkliston*,	1877
	J. Moolman, M.B., C.M., *Cape of Good Hope*,	1877
295	Graham Steell, M.D., F.R.C.P.L., *Manchester*,	1877
	John Brown, M.D., F.R.C.S. Eng., *Padiham*,	1878
	James Allan Philip, M.D., *Boulogne-sur-Mer*,	1878
	Alex. Robert Coldstream, M.D., F.R.C.S. Ed., *Florence*,	1878

		Date of Admission.
	Professor Johnson Symington, M.D., F.R.C.S. Ed., M.R.C.S. Eng., *Belfast*,	1878
300	P. M'Bride, F.R.C.S.E., *Harrogate*,	1879
	A. D. Leith Napier, M.D., M.R.C.P.L., *Australia*,	1879
	W. B. Dow, M.D., LL.D., F.R.C.S. Ed., *Dunfermline*,	1879
	John Home-Hay, M.D., M.R.C.S. Eng., *Alloa*,	1880
	John Hutton Balfour, M.B., C.M., *Portobello*,	1881
305	John Mackay, M.D., L.R.C.S. Ed., *Aberfeldy*,	1881
	William Badger, M.B., C.M., *Penicuik*,	1882
	James Rutherford Morison, M.B., F.R.C.S. Ed., *Newcastle*,	1882
	Roderick Maclaren, M.D., *Carlisle*,	1882
	J. Maxwell Ross, M.B., F.R.C.S. Ed., *Dumfries*,	1882
310	John Carlyle Johnstone, M.D., C.M., *Melrose*,	1882
	F. W. Dyce Fraser, M.D., F.R.C.P. Ed., *London*,	1883
	Edwin Baily, M.B., C.M., *Oban*,	1883
	William Hy. Shirreff, M.B., C.M., *Melbourne*,	1883
	John Haddon, M.D., C.M., *Denholm*,	1883
315	A. W. Hare, M.B., F.R.C.S. Ed., M.R.C.S. Eng., *Roche*,	1883
	Professor G. Sims Woodhead, M.D., F.R.C.P. Ed., *Cambridge*,	1883
	John Macdonald Brown, M.D., F.R.C.S. Eng. & Ed., *London*,	1883
	Thomas R. Scott, M.D., C.M., *Musselburgh*,	1884
	F. A. Saunders, F.R.C.S. Ed., *Grahamstown, South Africa*,	1884
320	Joseph Carne Ross, M.D., F.R.C.P. Ed., *Withington*,	1884
	G. J. H. Bell, M.B., C.M., *Bengal Army*,	1884
	W. C. Greig, M.D., C.M., *Morocco*,	1884
	T. Wyld Fairman, L.R.C.P. & S. Ed.,	1884
	Andrew Brown, M.D., M.R.C.P. Ed., *London*,	1884
325	Ernest F. Neve, M.D., F.R.C.S. Ed., M.R.C.S. Eng., *India*,	1884
	James Robertson Crease, F.R.C.S. Ed., *South Shields*,	1885
	T. Edgar Underhill, M.D., F.R.C.S. Ed., *Burnt Green*,	1885
	James Murdoch Brown, M.D., F.R.C.P. Ed.,	1885
	Robert W. Felkin, M.D., *London*,	1885
330	S. Hale Puckle, M.B., C.M., *Bishop's Castle*,	1885
	Skene Keith, M.B., F.R.C.S. Ed., *London*,	1885
	Reginald Ernest Horsley, M.D., F.R.C.S. Ed., *Crail*,	1886
	Professor Robert Fraser Calder Leith, M.B., F.R.C.P. Ed., *Birmingham*,	1886
	John Batty Tuke, Jr., M.D., F.R.C.P. Ed., *Polton*,	1886
335	James Hogarth Pringle, M.B., C.M., *Glasgow*,	1886
	Walter Scott Lang, M.D., F.R.C.S. Ed.,	1886
	William Gayton, M.D., M.R.C.S. Eng., *London*,	1886
	A. Bell Whitton, M.B., C.M., *Aberchirder*,	1886
	J. Walton Hamp, L.F.P. & S. Glasg., L.S.A. Lond., *Wolverhampton*,	1887
340	John Keay, M.B., F.R.C.P. Ed., *Uphall*,	1887
	John F. Sturrock, M.B., C.M., *Broughty Ferry*,	1887
	David W. Aitken, M.B., C.M., *London*,	1887
	Robert Inch, M.B., C.M., *Gorebridge*,	1887
	John Shaw M'Laren, M.B., F.R.C.S. Ed., *India*,	1887
345	William Hunter, M.D., M.R.C.S. Eng., M.R.C.P.L., *London*,	1887
	Sydney Rumboll, L.R.C.P. Ed., F.R.C.S. Ed., *Leeds*,	1887
	George Franklin Shiels, M.D., F.R.C.S. Ed., *San Francisco*,	1887
	D. H. Anderson, M.D., C.M., *Barrow-in-Furness*,	1887
	J. A. Armitage, M.D., C.M., *Wolverhampton*,	1887
350	Charles C. Teacher, M.B., C.M., *North Berwick*,	1887
	Thomas Russell, M.B., C.M., *Glasgow*,	1888
	Professor Sir John M'Fadyean, M.B., C.M., *London*,	1888
	James W. Martin, M.D., F.R.C.P. Ed., *Dumfries*,	1888
	J. R. Home Rose, M.B., F.R.C.P. Ed., *Burmah*,	1888
355	John Smith, M.D., M.R.C.S. Eng., *Kirkcaldy*,	1889
	Benjamin D. C. Bell, L.R.C.P. & S. Ed., *Kirkcaldy*,	1889
	A. Home Douglas, M.B., F.R.C.P. Ed., *Nice*,	1889

		Date of Admission.
	Surgeon-Captain C. H. Bedford, M.D., D.Sc., M.R.C.S. Eng., *Bengal Army*,	1889
	Alexander John Keiller, L.R.C.P. & S. Ed., *New Brunswick*,	1889
360	D. G. Braidwood, M.B., C.M., *Halkirk, Caithness*,	1889
	Professor J. Berry Haycraft, M.D., D.Sc., *Cardiff*,	1889
	Albert E. Morison, M.B., F.R.C.S. Ed., M.R.C.S. Eng., *Sunderland*,	1889
	William H. Barrett, M.B., C.M., *Southport*,	1890
	James Hunter, M.D., C.M., *Linlithgow*,	1890
365	William Smith, L.R.C.P. & S. Ed., *America*,	1890
	Professor Ralph Stockman, M.D., F.R.C.P. Ed., *Glasgow*,	1891
	Charles Templeman, M.D., C.M., *Dundee*,	1891
	J. J. Douglas, M.D., F.R.C.P. Ed., *London*,	1891
	Robert Stirling, M.B., F.R.C.S. Ed., *Perth*,	1891
370	Simson C. Fowler, M.B., C.M., *Juniper Green*,	1892
	Robert Dundas Helm, M.D., C.M., *Carlisle*,	1892
	William Gordon Woodrow Sanders, M.B., F.R.C.P. Ed., *Cannes*,	1892
	Ernest Coleman Moore, M.B., C.M.,	1892
	William Crawford M'Ewan, M.D., C.M., *Prestonpans*,	1892
375	W. Ramsay Smith, M.B., C.M., *South Australia*,	1892
	Alexander Peyer, M.D., *Zürich*,	1893
	Alexander Reid Urquhart, M.D., F.R.C.P. Ed., *Perth*,	1893
	F. W. Foxcroft, M.D., C.M., *Wilmslow*,	1893
	William B. Mackay, M.D., M.R.C.S. Eng., *Berwick-on-Tweed*,	1893
380	Alex. Mitchell Stalker, M.D., C.M., *Dundee*,	1893
	Professor Richard James Arthur Berry, M.D., F.R.C.S. Ed., *Melbourne*,	1893
	William Brendon T. Gubbin, M.D., C.M., *Bardolph, Hertford*,	1893
	Frank Ashby Elkins, M.D., C.M., *Watford*,	1893
	Robert Mackenzie, M.D., C.M., *Napier, Nairn*,	1893
385	William Simmers, M.B., C.M., *Gordon*,	1894
	James Mackenzie, M.D., C.M., *Burnley*,	1894
	William Craig, M.D., C.M., *Cowdenbeath*,	1894
	Professor Robert Muir, M.D., F.R.C.P. Ed., *Glasgow*,	1894
	Gopal Govind Vatve, M.D., *Bombay*,	1895
390	James Middlemass, M.D., F.R.C.P. Ed., *Ryhope*,	1895
	Lewis Campbell Bruce, M.D., F.R.C.P. Ed., *Murthly*,	1895
	John Hardie, M.B., F.R.C.S. Ed., *Stogursey*,	1895
	John Struthers, M.B., C.M., *South Africa*,	1895
	Sir George Thomas Beatson, K.C.B., M.D., C.M., *Glasgow*,	1895
395	Donald Macaulay, M.B., C.M., *Johannesburg*,	1895
	Andrew Balfour, M.D., C.M., *Khartoum*,	1895
	William Alexander Mackintosh, M.B., C.M., *Stirling*,	1896
	John Anderson, M.B., C.M., *Pitlochry*,	1896
	George Kerr Grimmer, M.D., F.R.C.S. Ed., *Canada*,	1897
400	John Frank Crombie, M.D., C.M., *North Berwick*,	1897
	Edward Arthur Mills-Roberts, M.B., C.M., *Bangor*,	1897
	Samuel Macvie, M.B., C.M., *Chirnside*,	1897
	Donald George Macleod Munro, M.D., C.M., *Cheltenham*,	1898
	Andrew William Messer, M.B., C.M., *Scotswood-on-Tyne*,	1899
405	Samuel William Carruthers, M.D., C.M., *London*,	1899
	Frederick William Reid Mackay, M.D., F.R.C.S.Ed., *New Zealand*	1899
	Charles Cromhall Easterbrook, M.D., C.M., *Dumfries*,	1899
	Thomas Paul Gray, M.D., C.M., *Hampstead*,	1899
	Robert Black Purves, M.B., F.R.C.S. Ed., *Lincoln*,	1899
410	David Waterston, M.D., F.R.C.S.E., *London*,	1900
	Charles Begg, M.B., C.M., *Bath*,	1900
	John Stevenson, M.B., F.R.C.S. Ed.,	1900
	Thomas Davy Luke, M.B., F.R.C.S. Ed., *Peebles*,	1900
	William Hartley Bunting, M.D., F.R.C.S. Ed., *Birmingham*,	1900

		Date of Admission.
415	James Ernest Moorhouse, M.D., C.M., *Stirling*,	1901
	David Allan Carruthers, M.B., C.M., *Perth*,	1901
	Noel Dean Bardswell, M.D., M.R.C.P. Ed. & Lond., M.R.C.S. Eng., *Sussex*,	1901
	Stuart M'Donald, M.D., F.R.C.P. Ed., *Newcastle-on-Tyne*,	1901
	George Robert Livingston, M.D., C.M., *Dumfries*,	1901
420	John Andrew Douglas Thompson, M.B., Ch.B., *Manchester*,	1901
	Joseph William Leech, M.D., *Newcastle-on-Tyne*,	1901
	H. de M. Alexander, M.D., *Aberdeen*,	1901
	David Whiteside Maclagan, M.B., Ch.B., *New Zealand*,	1901
	William Butterworth MacTier, M.B., C.M., *St Andrews*,	1901
425	Alexander Hill Macpherson, L.R.C.P. & S. Ed.,	1901
	Samuel Fergusson, M.B., C.M., *Alloa*,	1902
	Walter de Watteville, M.D., C.M., *Kingussie*,	1902
	Professor David Hepburn, M.D., C.M., *Cardiff*,	1902
	Charles Forsyth, M.B., F.R.C.S. Ed., *Hong-Kong*,	1903
430	George Warwick Bampfylde Daniell, M.R.C.S. Eng., L.R.C.P.L., *Cape Town*,	1903
	Herbert Dunbar Shepherd, M.B., F.R.C.S. Ed., *Derby*,	1903
	Theodore Charles Mackenzie, M.D., Ch.B., *Lochgilphead*,	1904
	Malcolm Campbell, M.B., F.R.C.S. Ed., *Brechin*,	1904
	Auckland Campbell Geddes, M.D., Ch.B., *Dublin*,	1904
435	Professor James Martin Beattie, M.B., C.M., *Sheffield*,	1904
	George Douglas M'Rae, M.B., C.M., *Ayr*,	1904
	William Brown, M.B., Ch.B., *Braemar*,	1904
	Frank Lockwood Atkinson, M.B., Ch.B., *New Zealand*,	1904
	Peter Murray, M.B., F.R.C.S. Ed., *Leven*,	1904
440	Hector Douglas Wilson, M.D., Ch.B., *Harrogate*,	1904
	James Crawford Gibb Macnab, M.B., F.R.C.S. Ed., *South Africa*,	1904
	William Vernon Shaw, M.D., Ch.B., *Malton*,	1905
	Henry Grey Brown, M.D., C.M., *Stonehaven*,	1905
	John Henry Montgomerie Bell, M.D., Ch.B., *Camberwell*,	1905
445	James William Somerville, M.D., D.P.H., *Galashiels*,	1905
	Arthur J. de Spizonovicz, M.B., Ch.B., *Dunlee, Tranent*,	1905
	William H. Myers, M.D., *Indiana, U.S.A.*,	1906
	Herbert Sloman, L.R.C.P.L., M.R.C.S. Eng., *Bedford*,	1906
	Frederick Dittmar, M.D., D.P.H., *Murrayfield*,	1906
450	Henry J. Dunbar, M.D., Ch.B., *Cardiff*,	1906
	Alfred Nolan Fell, M.D., M.R.C.P. Ed., *Colchester*,	1907
	William MacKirdy, L.R.C.P. Ed., L.R.C.S. Ed., *Peterborough*,	1907
	James Bartholomew Mears, L.R.C.P. & S. Ed., *Lanchars*,	1907
	John Henry Douglas Webster, M.D., Ch.B.,	1907
455	Louis Fourie, M.B., Ch.B., *South Africa*,	1908
	Rae Gibson, M.B., M.R.C.P. Ed.,	1910
	J. C. Thomson, M.D., *Dumfries*,	1910

ORDINARY MEMBERS.

ARRANGED ALPHABETICALLY.

(*a*) Members who pay the Annual Subscription.

	Dr R. Abernethy, 10 St Colme Street,	1892
	Sir J. O. Affleck, 38 Heriot Row,	1871
	Dr A. C. Ainslie, 49 Minto Street,	1898
	Dr R. S. Aitchison, 74 Great King Street,	1887
5	Dr E. F. Armour, 6 Brunstfield Terrace,	1890
	Dr Harold S. Ballantyne, Dalkeith,	1899
	Dr J. W. Ballantyne, 19 Rothesay Terrace,	1885

		Date of Admission.
	Dr A. H. Freeland Barbour, 4 Charlotte Square,	1881
	Dr Lewis Beesley, 42 Northumberland Street,	1905
10	Dr G. A. Berry, 31 Drumsheugh Gardens,	1883
	Dr Robert H. Blaikie, 5 Mayfield Gardens,	1883
	Dr G. P. Boddie, 35 Melville Street,	1888
	William Booth, Esq., 2 Minto Street,	1888
	Dr Philip G. Borrowman, 21 Pitt Street,	1893
15	Dr John M. Bowie, 53 Grange Road.	1901
	Dr F. D. Boyd, C.M.G., 22 Manor Place,	1891
	Dr Byrom Bramwell, 23 Drumsheugh Gardens,	1876
	Dr Edwin Bramwell, 24 Walker Street,	1900
	Dr N. T. Brewis, 6 Drumsheugh Gardens,	1886
20	Dr A. J. Brock, 27 Braid Crescent,	1907
	Dr J. J. Graham Brown, 3 Chester Street,	1878
	Dr R. Dods Brown, Royal Asylum, Edinburgh,	1908
	Dr W. H. Bryce, Lathallan House, Colinsburgh,	1911
	Dr A. H. Buchan, 2 Dean Terrace,	1899
25	Dr Buist, 1 Clifton Terrace,	1877
	Dr T. M. Burn-Murdoch, 14 Charlotte Square,	1886
	Dr J. Burnet, 6 Glengyle Terrace,	1907
	Professor Francis M. Caird, 13 Charlotte Square,	1883
	Dr H. L. Calder, 60 Leith Walk, Leith,	1884
30	Dr James Cameron, 71 Newington Road,	1895
	Dr A. N. S. Carmichael, 2 Merchiston Avenue,	1902
	Dr Edward Carmichael, 21 Abercromby Place,	1887
	Dr E. W. Scott Carmichael, 40 Palmerston Place,	1901
	Dr George Scott Carmichael, 25 Braid Road,	1903
35	Dr J. Carmichael, 22 Northumberland Street,	1870
	Dr N. Scott Carmichael, 44 Polwarth Terrace,	1910
	Dr George J. R. Carruthers, 4A Melville Street,	1901
	C. W. Cathcart, Esq., 44 Melville Street, *Vice-President*,	1883
	Dr J. G. Cattanach, 3 Alvanley Terrace,	1895
40	George L. Chiene, Esq., 23 Alva Street,	1901
	Emeritus Professor John Chiene, C.B., 21 Alva Street,	1867
	Dr A. E. Chisholm, 7 Claremont Crescent,	1910
	Dr H. M. Church, 36 George Square,	1876
	Dr A. W. Greenhorn Clark, 24 Braid Crescent,	1908
45	Dr R. D. Clarkson, Larbert Institution, Larbert,	1896
	Sir T. S. Clouston, 26 Heriot Row,	1861
	Dr John D. Comrie, 25 Manor Place,	1902
	Dennis Cotterill, Esq., 10 Coates Crescent,	1909
	J. M. Cotterill, Esq., 24 Manor Place, *President*,	1878
50	Dr John Craig, 216 Bruntsfield Place,	1900
	Dr William Craig, 71 Bruntsfield Place,	1869
	Dr D. M. Crichton, Burgh House, Maryhill, Glasgow,	1906
	Dr David Halliday Croom, 17 Alva Street,	1906
	Professor Sir John Halliday Croom, 25 Charlotte Square,	1870
55	Dr W. J. Crow, 108 Morningside Road,	1908
	Dr G. Matheson Cullen, 50 Minto Street,	1892
	Dr John Cumming, 70 Bruntsfield Place,	1894
	Dr T. B. Darling, 13 Merchiston Place,	1887
	Dr G. A. Davies, 7 West Holmes Gardens, Musselburgh,	1906
60	Dr Michael Dewar, 24 Lauriston Place,	1885
	Dr Thomas W. Dewar, Kincairn, Dunblane,	1906
	Dr J. T. Dickie, 37 Lauriston Place,	1900
	Dr D. Elliot Dickson, Hill Crescent, Lochgelly, Fife,	1906
	Dr George Dickson, 26 Merchiston Park,	1901
65	Dr W. E. Carnegie Dickson, 100 Findhorn Place,	1902
	Dr Alex. Don, Park House, Nethergate, Dundee,	1909
	Dr C. E. Douglas, Cupar-Fife,	1894
	Dr Kenneth M. Douglas, 19 Chester Street,	1888
	J. W. Dowden, Esq., 48 Manor Place, *Treasurer*,	1893

		Date of Admission.
70	Dr W. B. Drummond, 2 Braidburn Terrace,	1900
	Dr James K. Drysdale, 22 Coltbridge Terrace,	1901
	Dr John A. H. Duncan, 4 Cluny Drive,	1895
	Dr H. M. Dunlop, 20 Abercromby Place,	1883
	Dr J. C. Dunlop, 33 Chester Street,	1892
75	Dr John Eason, 58 Northumberland Street,	1900
	Dr William Elder, 4 John's Place, Leith,	1892
	Dr J. Haig Ferguson, 7 Coates Crescent,	1885
	Dr Thomas Finlay, 8 Comely Bank Road,	1903
	Dr Andrew F. Fleming, St John's Road, Corstorphine,	1905
80	Dr R. A. Fleming, 10 Chester Street,	1890
	Dr A. B. Flett, 15 Walker Street,	1903
	Dr W. E. Foggie, 4 Airlie Place, Dundee,	1907
	Dr A. Dingwall Fordyce, 8 Manor Place,	1901
	Dr W. Fordyce, 20 Charlotte Square,	1907
85	Dr J. S. Fowler, 55 Northumberland Street, *Secretary*,	1895
	Dr John Fraser, 54 Great King Street,	1878
	John Fraser, Esq., 9 Grosvenor Street,	1911
	Dr J. Hossack Fraser, Fernfield, Bridge of Allan,	1895
	Dr J. S. Fraser, 50 Melville Street,	1905
90	Prof Sir Thomas R. Fraser, 13 Drumsheugh Gardens,	1865
	Dr W. Ernest Frost, 36 Moray Place,	1904
	Dr G. Fyfe, 24 Broughton Place,	1911
	Dr F. Gardiner, 9 George Square,	1900
	Dr J. H. Gibbs, 12 Coates Crescent,	1905
95	Dr G. A. Gibson, 3 Drumsheugh Gardens,	1880
	Dr A. B. Giles, 4 Palmerston Place,	1893
	Dr Alexander Goodall, 7 Mayfield Road,	1901
	Dr D. J. Graham, 26 Rutland Street,	1897
	Dr F. M. Graham, 16 Mayfield Gardens,	1894
100	Dr J. M. Graham, 6 Castle Terrace,	1908
	Dr J. Taylor Grant, 3 Manor Place,	1898
	Dr J. Allan Gray, 107 Ferry Road,	1879
	Dr John Alexander Gray, 4 Wolseley Terrace,	1911
	Dr John L. Green, 23 Minto Street,	1904
105	Emeritus Professor Greenfield, 7 Heriot Row,	1886
	Dr David M. Greig, 25 Tay Street, Dundee,	1892
	Dr G. L. Gulland, 11 Chester Street,	1888
	Dr James A. Gunn, 18 Morning-side Drive,	1906
	Dr A. C. Guthrie, 21 Pilrig Street,	1890
110	Dr William Guy, 11 Wemyss Place,	1890
	Dr William Haldane, Viewforth, Bridge of Allan,	1889
	Dr D. Berry Hart, 5 Randolph Cliff,	1886
	Dr James Harvey, 7 Blenheim Place,	1893
	Dr A. Fergus Hewat, 9 Grosvenor Street,	1911
115	J. W. B. Hodsdon, Esq., 6 Chester Street,	1883
	Dr George Hunter, 33 Palmerston Place,	1876
	Dr David Huskie, Moffat,	1899
	Dr R. W. Inkster, 16 Windsor Street,	1895
	Dr Alex. James, 14 Randolph Crescent, *Vice-President*,	1877
120	Dr Allan Jamieson, 35 Charlotte Square,	1876
	Dr Hugh Jamieson, 1 Strathearn Road,	1880
	Dr J. Boyd Jamieson, 43 George Square,	1900
	Dr Frank E. Jardine, Evelyn Cottage, Penicuik,	1911
	Dr G. M. Johnston, 7 Wellington Place, Leith,	1888
125	Dr R. J. Johnston, 18 George Square,	1897
	Dr R. W. Johnstone, 10 Alva Street,	1907
	Dr C. B. Ker, City Hospital, Comiston Road,	1894
	Dr F. K. Kerr, 168 Newhaven Road, Leith,	1910
	Dr George Kerr, 6 St Colme Street,	1885
130	Dr J. Lamond Lackie, 7 Randolph Crescent,	1907
	Dr H. G. Langwell, 4 Hermitage Place, Leith,	1899

		Date of Admission.
	Dr G. Laurence, Annfield House, Dundee,	1910
	Dr David Lawson, Nordrach-on-Dee, Banchory,	1901
	Dr H. A. Leebody, Corstorphine,	1899
135	Dr Edwin M. Lithgow, 8 Alva Street,	1901
	Dr John D. Lithgow, 8 Alva Street,	1901
	Professor Harvey Littlejohn, 11 Rutland Street,	1889
	Emeritus Professor Sir Henry D. Littlejohn, 24 Royal Circus,	1853
	James Lochhead, Esq., Gibraltar,	1911
140	Dr R. Cranston Low, 7 Castle Terrace,	1906
	Dr R. A. Lundie, 55A Grange Road,	1883
	Dr W. Leslie Lyall, 8 Murrayfield Gardens,	1902
	Dr D. C. A. M'Allum, 11 Greenhill Gardens,	1900
	Dr Angus Macdonald, 42 Polwarth Terrace,	1902
145	Dr John M'Gibbon, 24 Melville Street,	1899
	Dr C. W. MacGillivray, 15 Charlotte Square,	1877
	Dr A. M. M'Intosh, 30 East Claremont Street,	1904
	Dr Archibald Mackintosh, 50 Trinity Road,	1911
	Dr George Mackay, 20 Drumsheugh Gardens,	1887
150	Dr A. M'Kendrick, 27 Chalmers Street,	1909
	Dr W. Leslie Mackenzie, 1 Stirling Road, Trinity,	1895
	Dr Malcolm M'Larty, 7 Bellevue Place,	1900
	Dr John Macmillan, 48 George Square,	1897
	Dr C. M'Neil, 23 Stafford Street,	1909
155	Dr John Macpherson, 15 Rutland Square,	1891
	Dr John MacRae, Lynwood, Murrayfield Road,	1893
	Dr Douglas M'Rae, Glengall, Ayr,	1904
	Dr Alexander M. Malcolmson, St John's Road, Corstorphine,	1905
	Major D. G. Marshall, I.M.S., 25 Buckingham Terrace,	1905
160	Dr A. A. Matheson, 41 George Square,	1901
	Dr Roderick M. Matheson, 33 Buccleuch Place,	1902
	Dr George D. Mathewson, 23 Stafford Street,	1911
	Dr Edwin Matthew, 9 Walker Street,	1900
	Dr J. Halley Meikle, 12 Midmar Gardens,	1906
165	Dr Kenmure Melville, 2 Nile Grove,	1908
	Dr D. Menzies, 20 Rutland Square,	1878
	A. Miles, Esq., 20 Walker Street, *Secretary*,	1892
	Dr J. Mill, 188 Ferry Road,	1886
	A. G. Miller, Esq., 8 Garscube Terrace,	1867
170	Dr James Miller, 24 Queen Street,	1910
	Dr W. H. Miller, 51 Northumberland Street,	1895
	Dr W. Morrison Milne, 3 Minto Street,	1905
	Dr John Mowat, 5 Hope Park Terrace,	1885
	Dr R. S. Mowat, 40 Raeburn Place,	1912
175	Dr T. Goodall Nasmyth, 27 Palmerston Place,	1884
	Dr H. Oliphant Nicholson, 20 Manor Place,	1900
	Dr John Orr, 6 Strathearn Road,	1895
	Dr W. Basil Orr, 13 Braid Road,	1893
	Dr G. Keppie Paterson, 19 Albany Street,	1889
180	Dr J. V. Paterson, 11 Melville Street,	1900
	Dr Simla Paterson, 147 Bruntsfield Place,	1904
	Dr William Paterson, 8 Hermitage Place, Leith,	1909
	Dr P. Pattison, 4 Novar Crescent, Kirkcaldy,	1907
	Dr C. Balfour Paul, Carlisle,	1904
185	Dr C. M. Pearson, 14 Manor Place,	1902
	Dr John H. H. Pearson, 12 Primrose Bank Road, Trinity,	1911
	Dr H. A. Peddie, 24 Palmerston Place,	1893
	Dr R. W. Philip, 45 Charlotte Square,	1883
	Dr J. H. Harvie Pirie, 5 Castle Terrace,	1905
190	Dr Playfair, 5 Melville Crescent, *Vice-President*,	1874
	Dr Frederick Porter, 65 Morningside Road,	1904
	Dr W. G. Porter, 16 Manor Place,	1907
	Dr Edmond Price, 1 Middleby Street,	1909

		Date of Admission.
	Dr T. Proudfoot, 30 Lauriston Place,	1889
105	Dr Harry Rainy, 16 Great Stuart Street,	1896
	Dr Douglas G. Reid, Finkenberg, St Barnabas Road, Cambridge,	1905
	Dr H. S. Reid, 3 Hampton Terrace,	1910
	Dr James Ritchie, 22 Charlotte Square,	1873
	Dr James Ritchie, 10 Succoth Gardens,	1907
200	Dr L. C. Peel Ritchie, 7 Alva Street,	1904
	Dr W. T. Ritchie, 9 Atholl Place,	1900
	Dr George M. Robertson, Tipperlinn House, Morningside Place,	1890
	Dr Robert Robertson, 26 Royal Circus,	1901
	Dr William Robertson, 16 Stirling Road,	1902
205	Dr W. Ford Robertson, 48 Northumberland Street,	1893
	Dr W. G. Aitchison Robertson, 2 Mayfield Gardens,	1892
	Dr R. M. Ronaldson, 17 Morningside Road,	1895
	Dr T. R. Ronaldson, 8 Charlotte Square,	1877
	Dr A. Aitken Ross, 8 Newington Road,	1902
210	Dr J. Stuart Ross, 15 Lennox Street,	1908
	Dr William Russell, 3 Walker Street,	1884
	Dr E. G. Salt, 59 George Square,	1895
	Dr James Scott, 43 Minto Street,	1895
	Dr Theodore Shennan, 95 Mayfield Road,	1897
215	Dr W. C. Sillar, 2 Lockharton Gardens,	1900
	Emeritus Professor Sir Alexander R. Simpson, 52 Queen Street,	1859
	Dr F. D. Simpson, 9 Hampton Terrace,	1905
	Dr G. F. Barbour Simpson, 43 Manor Place,	1900
	Dr John W. Simpson, 19 Lansdowne Crescent,	1901
220	Dr Arthur H. H. Sinclair, 5 Walker Street,	1900
	A. A. Scot Skirving, Esq., C.M.G., 8 Randolph Crescent,	1897
	Dr A. T. Sloan, 22 Abercromby Place,	1885
	Dr James Smith, 4 Brunton Place,	1891
	Dr J. Cormack Smith, 9 Brunton Place,	1896
225	Dr J. W. Steven, 13 Manor Place,	1900
	Dr John Stevens, 78 Polwarth Terrace,	1892
	Dr Norman L. Stevenson, 7 Alva Street,	1902
	Dr Ian Struthers Stewart, 13 Castle Terrace,	1906
	Dr J. S. Stewart, 15 Merchiston Place,	1885
230	Dr Robert Stewart, 25 George Square,	1892
	Dr William Stewart, 146 Ferry Road, Leith,	1889
	H. J. Stiles, Esq., 9 Great Stuart Street,	1889
	Dr John Strachan, Dollar,	1867
	John W. Struthers, Esq., 2 Chester Street,	1901
235	W. J. Stuart, Esq., 9 Chester Street,	1902
	Dr William G. Sym, 12 Alva Street,	1889
	Dr W. Taylor, 12 Melville Street,	1871
	Dr W. Macrae Taylor, 8 Melville Street,	1903
	Dr C. H. Thatcher, 8 Melville Crescent,	1876
240	Dr L. H. F. Thatcher, 8 Melville Crescent,	1910
	Dr R. Thin, 25 Abercromby Place,	1890
	Professor Alexis Thomson, 30 Drumsheugh Gardens,	1887
	Dr H. Torrance Thomson, 3 Hillside Crescent,	1900
	Dr John Thomson, 14 Coates Crescent,	1887
245	Dr Thomas James Thomson, 3 Greenhill Park,	1911
	Dr George Thyne, 13 Brunswick Street,	1904
	Dr T. J. Thyne, 16 Randolph Crescent,	1898
	Dr John Tod, 67 Ferry Road, Leith,	1895
	Dr H. M. Traquair, 30 Walker Street,	1910
250	Sir John Batty Tuke, M.P., 20 Charlotte Square,	1864
	Dr I. J. Turnbull, 6 Randolph Place,	1896
	Dr Dawson Turner, 37 George Square,	1890
	Dr Logan Turner, 27 Walker Street,	1892
	Henry Wade, Esq., 6 Manor Place,	1903

		Date of Admission.
255	Dr Alexander Walker, 1 Lauder Road,	1907
	Dr Norman Walker, 7 Manor Place,	1891
	D. Wallace, Esq , C.M.G., 29 Charlotte Square,	1887
	Dr Chalmers Watson, 11 Walker Street, *Editor of Transactions*,	1894
	A. Pirie Watson, Esq., 79 Willowbrae Avenue,	1911
260	Dr W. de Watteville, Kingussie,	1902
	Dr A. D. Webster, 18 Minto Street,	1883
	Dr H. L. Watson-Wemyss, 7 Coates Gardens,	1911
	D. P. D. Wilkie, Esq , 56 Manor Place,	1909
	Dr James Wilson, 53 Inverleith Row,	1900
265	J. L. Wilson, Esq., 4 Buccleuch Place,	1883
	Dr A. Murray Wood, 180 Ferry Road, Leith,	1907
	Dr Russell E. Wood, 9 Darnaway Street,	1883
	Professor John Wyllie, 44 Charlotte Square,	1868
	Dr James Young, 2 Randolph Place,	1911

(*b*) Members Exempted under Rule V. from paying the Annual Subscription.

270	Dr D. Aitken, 152 *Packington Street, Islington, London, N.*,	1887
	Dr H. de M. Alexander, *Aberdeen District Asylum, Aberdeen*,	1901
	Dr D. H. Anderson, 143 *Abbey Road, Barrow-in-Furness*,	1887
	Dr John Anderson, *Pitlochry*,	1896
	Dr J. A. Armitage, 58 *Waterloo Road, Wolverhampton*,	1887
275	Dr F. L. Atkinson, *Victoria Road, Devonport, Auckland, New Zealand*,	1904
	Dr W. Badger, *Penicuik*,	1882
	Dr Edwin Baily, *Oban*,	1883
	Dr Andrew Balfour, *Khartoum*,	1895
	Dr J. H. Balfour, *Portobello*,	1881
280	Dr Alexander Ballantyne, *Dalkeith*,	1872
	Dr Noel D. Bardswell, *Midhurst Sanitorium, Sussex*,	1901
	Dr W. H. Barrett, 29 *Park Crescent, Hesketh Park, Southport*,	1890
	Sir George T. Beatson, K.C.B., 7 *Woodside Crescent, Glasgow*,	1895
	Professor James M. Beattie, M.B., *The University, Sheffield*,	1904
285	Surgeon-Captain C. H. Bedford, *Bengal Army, care of W. Watson & Co.*, 28 *Apollo Street, Bombay*,	1889
	Dr Charles Begg, 62 *Pulteney Street, Bath*,	1900
	Dr Benjamin D. C. Bell, *Kirkwall*,	1889
	Dr G. J. H. Bell, *Bengal Army*,	1884
	Dr J. H. Montgomerie Bell, *Brunswick Square, Camberwell*,	1905
290	Dr G. H. Bentley, *Kirkliston*,	1877
	Professor Richard J. A. Berry, M.D., *University of Melbourne*,	1893
	Dr J. S. Beveridge, *Melton Constable, Norfolk*,	1861
	Dr J. W. Black, 15 *Clarges Street, Piccadilly, London, W.*,	1865
	Dr D. G. Braidwood, *Halkirk, Caithness*,	1889
295	Dr Andrew Brown, 1 *Bartholomew Road, Kentish Town, London, N.W.*,	1884
	Dr H. Grey Brown, 47 *Evan Street, Stonehaven*,	1905
	Dr James Murdoch Brown,	1885
	Dr John Brown,	1878
	Dr J. Macdonald Brown, 2 *Fragnall, Hampstead, London, N.W.*,	1883
300	Dr William Brown, *Braemar*,	1904
	Dr Lewis C. Bruce, *The Asylum, Murthly, Perthshire*,	1895
	Dr William Hartley Bunting, 22 *Islington Row, Edgbaston, Birmingham*,	1900
	Dr Malcolm Campbell, *Brechin*,	1904

		Date of Admission
	Dr D. A. Carruthers, 5 *Charlotte Street, Perth*,	1901
305	Dr S. W. Carruthers, 44 *Central Hill, Norwood, London, S.E.*,	1899
	Professor Cleland, *The University, Glasgow*,	1864
	Dr A. R. Coldstream, 24 *Lung Arno Nuovo, Florence, Italy*,	1878
	Dr William Craig, *Cowdenbeath, Fife*,	1894
	Dr J. R. Crease, 2 *Ogle Terrace, South Shields*,	1885
310	Dr J. Frank Crombie, *North Berwick*,	1897
	Dr Bampylde Daniell, *Adderley Street, Cape Town*,	1903
	Dr P. M. Deas, *Wonford House, Exeter*,	1868
	Dr Frederick Dittmar, 72 *Murrayfield Gardens*,	1906
	Dr A. Home Douglas, 5 *Rue de Russie, Nice, France*,	1889
315	Dr J. J. Douglas, 42 *Central Hill, Upper Norwood, London*,	1891
	Dr W. B. Dow, *Dunfermline*,	1879
	Dr Henry J. Dunbar, 118 *Cathedral Road, Cardiff*,	1906
	Dr C. C. Easterbrook, *Crichton House, Dumfries*,	1899
	Dr J. W. Eastwood, 18 *Farndon Road, Oxford*,	1871
320	Dr F. A. Elkins, *The Asylum, Leavesden, near King's Langley*,	1893
	Dr R. W. Felkin, 12 *Oxford Gardens, North Kensington, London, W.*,	1885
	Dr A. N. Fell, 11 *Lexden Road, Colchester*,	1907
	Dr Samuel Fergusson, *Lylestone House, Alloa*,	1902
	Right Hon. Sir R. B. Finlay, K.C., LL.D., *Middle Temple, London*,	1864
325	Dr Charles Forsyth, *Alexandra Buildings, Hong-Kong*,	1903
	Dr Fourie, *South Africa*,	1908
	Dr Simson C. Fowler, *Juniper Green*,	1892
	Dr F. W. Foxcroft, 47 *Newhall Street, Birmingham*,	1893
	Dr Dyce Fraser, 163 *Cornwall Road, London, S.W.*,	1883
30	Dr William Gayton, 11 *Redbourne Avenue, North Finchley, London, N.*,	1886
	Dr Campbell Geddes, Professor of Anatomy, *College of Surgeons, Dublin*,	1904
	Dr Rae Gibson,	1910
	Dr T. Paul Gray, 94 *Adelaide Road, Hampstead, N.W.*,	1899
	Dr W. C. Greig, *Otago, New Zealand*,	1884
335	Dr George K. Grimmer, *Canada*,	1807
	Dr Groesbeck, *Cincinnati*,	1875
	Dr W. B. T. Gubbin, *Redland Grove, Bristol*,	1803
	Dr John Haddon, *Denholm, Roxburghshire*,	1883
	Dr Archibald Hall, *Montreal*,	1853
340	Dr J. W. Hamp, *Penn Road, Wolverhampton*,	1887
	Dr John Hardie,	1895
	Dr A. W. Hare, *Newquay, Cornwall*,	1883
	Dr J. Home-Hay, *Alloa*,	1880
	Professor J. Berry Haycraft, *Llanishen, Cardiff*,	1880
345	Dr Stanley Haynes, *Malvern, Worcestershire*,	1804
	Dr R. Dundas Helm, 13 *Portland Square, Carlisle*,	1802
	Dr David Hepburn, Professor of Anatomy, *University College, Cardiff*,	1002
	Dr R. E. Horsley, *Crail, Fife*,	1886
	Dr James Hunter, *St Catherine's, Linlithgow*,	1890
350	Dr W. Hunter, 103 *Harley Street, Cavendish Square, London, W.*,	1887
	Dr Robert Inch, *Gorebridge*,	1887
	Dr James Johnston, 53 *Princes Square, Bayswater, London, W.*,	1871
	Dr J. Carlyle Johnstone, *The Asylum, Melrose*,	1882
	Dr J. Keay, *Banchory Asylum, Uphall*,	1887
355	Dr A. J. Keiller, *New Brunswick, Canada*,	1889
	Dr George Keith, *Market Cottage, Currie*,	1845
	Dr Skene Keith, 58 *Upper Berkeley Street, Portman Square, London, W.*,	1885

		Date of Admission.
	Dr W. Scott Lang,	1868
	Dr J. W. Leech, 12 *Eldon Square, Newcastle-on-Tyne,*	1901
360	Professor R. F. C. Leith, M.B., *The University, Birmingham,*	1886
	Dr John Linton, *Aberdour,*	1863
	Dr G. R. Livingston, 47 *Castle Street, Dumfries,*	1901
	Dr T. Davy Luke, *Peebles,*	1900
	Dr Donald Macaulay, *Jumpers' Gold Mining Co., P.O. Box 1043, Johannesburg,*	1895
365	Dr P. M'Bride, *Harrogate,*	1879
	Dr Stuart M'Donald, *Newcastle-on-Tyne,*	1901
	Dr John A. Macdougall, *Cannes, France,*	1875
	Dr William C. M'Ewan, *Prestonpans,*	1892
	Professor Sir J. M'Fadyean, 101 *Great Russell Street, London, W.C.,*	1888
370	Dr F. Reid Mackay, *New Zealand,*	1899
	Dr John Mackay, *Aberfeldy,*	1881
	Dr W. B. Mackay, 23 *Castlegate, Berwick-on-Tweed.*	1893
	Professor M'Kendrick, *Maxie Burn, Stonehaven,*	1870
	Dr James Mackenzie, 17 *Bentinck Street, London,*	1894
375	Dr Robert Mackenzie, *Napier, Nairn,*	1893
	Dr Theodore C. Mackenzie, *The Asylum, Lochgilphead,*	1904
	Dr William A. Mackintosh, 3 *Pork Terrace, Stirling,*	1896
	Dr William MacKirdy, 157 *Lincoln Road, Peterborough,*	1907
	Dr David W. Maclagan, *care of Dr Harrison, Eltham, Taranaki, New Zealand,*	1901
380	Dr J. Shaw M'Laren, *India,*	1887
	Dr Roderick M'Laren, 23 *Portland Square, Carlisle,*	1882
	Dr J. C. G. Macnab, *South Africa,*	1904
	Dr Alex. H. Macpherson,	1901
	Dr G. Douglas M'Rae, *Glengall House, Ayr,*	1904
385	Dr William B. MacTier, 7 *Queen's Gardens, St Andrews,*	1901
	Dr Samuel Macvie, *Chirnside,*	1897
	Dr J. W. Martin, *Charterhall, Newbridge, Dumfries,*	1888
	Dr J. B. Mears,	1907
	Dr Andrew W. Messer, *Lemington, Scotswood-on-Tyne,*	1899
390	Dr James Middlemass, *Boro' Asylum, Ryhope, Sunderland,*	1895
	Dr E. A. Mills-Roberts, *Bethesda, Bangor,*	1897
	Dr J. Moolman, *Cape of Good Hope,*	1877
	Dr E. C. Moore,	1892
	Dr J. E. Moorhouse, 6 *Melville Terrace, Stirling,*	1901
395	Dr A. E. Morison, *Mowbray Villa, Sunderland,*	1889
	Dr J. Rutherford Morison, 14 *Saville Row, Newcastle-on-Tyne,*	1882
	Professor Robert Muir, *The University, Glasgow,*	1894
	Dr D. G. Macleod Munro, 1 *Oriel Villas, Cheltenham,*	1898
	Dr Peter Murray, *Durie Street, Leven,*	1904
400	Dr W. H. Myers, *Indiana, U.S.A.,*	1906
	Dr Leith Napier, *The General Hospital, Adelaide, South Australia,*	1879
	Dr Ernest F. Neve, *Srinagar, Kashmir, India,*	1884
	Dr Peter Orphoot, *North Berwick,*	1865
	Dr T. Wyld Pairman, *Hinemoa, Moffat,*	1884
405	Professor Bell Pettigrew, *St Andrews,*	1873
	Dr Alexander Peyer, *Zürich,*	1893
	Dr J. A. Philip, *Rue Victor Hugo, Boulogne-sur-Mer, France,*	1878
	Dr J. H. Pringle, 172 *Bath Street, Glasgow,*	1886
	Dr S. Hale Puckle, *Bishop's Castle,*	1885
410	Dr R. B. Purves, 5 *Minster Yard, Lincoln,*	1899
	Dr J. Maxwell Ross, *St Ruth's, Maxwelltown, Dumfries,*	1882
	Dr J. R. Home Ross, *Burmah,*	1888
	Dr Joseph C. Ross, *Withington,*	1884
	Dr S. Rumboll, *Cavendish House, Leeds,*	1887
415	Dr Thomas Russell, *Beechwood, Parkhead, Glasgow,*	1888

		Date of Admission.
	Dr Gordon Sanders, *Cannes, France*,	1892
	Dr F. A. Saunders, *Grahamstown, South Africa*,	1884
	Dr Thomas R. Scott, *Musselburgh*,	1884
	Dr W. Vernon Shaw, 42 *Yorkersgate, Malton, Yorks*,	1905
420	Dr Herbert D. Shepherd, 45 *Kedleston Road, Derby*,	1903
	Dr G. F. Shiels, 229 *George Street, San Francisco*,	1887
	Dr W. H. Shirreff, *Port Fairy, Victoria, Australia*,	1883
	Dr William Simmers, *Gordon, Berwickshire*,	1894
	Dr Herbert Sloman, 65 *Goldington Road, Bedford*,	1906
425	Dr John Smith, *Bryechall, Kirkcaldy*,	1889
	Dr William Smith, *America*,	1890
	Dr W. Ramsay Smith, *The General Hospital, Adelaide, South Australia*,	1892
	Dr Van Someren, *Northwood, Middlesex*,	1845
	Dr J. W. Somerville, 12 *Abbotsford Road, Galashiels*,	1905
430	Dr Arthur J. de Spiganovicz, *Dunloe, Tranent*,	1905
	Dr A. M. Stalker, 156 *Perth Road, Dundee*,	1893
	Dr Graham Steell, 96 *Mosley Street, Manchester*,	1877
	Professor Stephenson, *University, Aberdeen*,	1861
	Dr John Stevenson,	1900
435	Dr Robert Stirling, 4 *Atholl Place, Perth*,	1891
	Professor Ralph Stockman, *The University, Glasgow*,	1891
	Dr H. R. Storer, *Newport, Rhode Island, U.S.A.*,	1855
	Dr John Struthers, *Ngamakwe, Transkei, South Africa*,	1895
	Dr J. F. Sturrock, *Arima, Broughty Ferry*,	1887
440	Professor J. Symington, *Queen's College, Belfast*,	1878
	Dr C. C. Teacher, *North Berwick*,	1887
	Dr C. Templeman, *Sanitary Office, Bell Street, Dundee*,	1891
	Dr J. A. Douglas Thompson, *Comberton House, Hale-owen, Manchester*,	1901
	Dr J. C. Thomson, *Dumfries*,	1910
445	Dr J. Stitt Thomson, *Castle Hill House, Lincoln*,	1877
	Dr J. Batty Tuke, Jr., *Mavishank*,	1886
	Dr R. S. Turner, *Keith*,	1867
	Dr T. Edgar Underhill, *Dunedin, Burnt Green, Worcestershire*,	1885
	Dr A. R. Urquhart, *Murray House, Perth*,	1893
450	Dr Gopal Govind Vatve, *care of H. H. the Rajah of Miraj, Bombay, India*,	1895
	Dr David Waterston, F.R.C.S.E., *London*,	1900
	Dr Walter de Watteville, *Kingussie*,	1902
	Dr J. H. Douglas Webster,	1907
	Dr A. B. Whitton, *Aberchirder*,	1886
455	Dr H. Douglas Wilson, 3 *Ripon Road, Harrogate*,	1904
	Professor G. Sims Woodhead, *Pathological Laboratory, New Museums, The University, Cambridge*,	1883
	Dr Yellowlees, 6 *Albert Gate, Dowanhill, Glasgow*,	1862

N.B.—*Members are requested to communicate with the Secretaries if they discover any errors or omissions in the List, and also to intimate all changes in their addresses.*

CONTENTS.

I.—ORIGINAL COMMUNICATIONS.

(*a*) General.

PAGE

1. Valedictory Address. By the President, Byrom Bramwell, M.D., F.R.S.P.E., Consulting Physician, Royal Infirmary, Edinburgh; Physician, Chalmers Hospital 4

2. Vaccine Therapy. By James Ritchie, M.D., F.R.C.P., Director, College of Physicians' Laboratory 28

3. Trauma as a Factor in Disease. By Alexander James, M.D., F.R.C.P.E., Consulting Physician, Royal Infirmary; Consulting Physician to Edinburgh City Fever Hospital (*with* 3 *Plates*) . 69

4. Orthoradiography of Heart and Aorta. By Hope Fowler, M.B., F.R.C.P.E., Radiographer to the Royal Infirmary, Edinburgh, and W. T. Ritchie, M.D., F.R.C.P., Assistant-Physician, Royal Infirmary (*with* 1 *Plate and* 11 *Figures*) . 102

5. Insufficient Data as a Cause of Faulty Interpretation of Radiographs (*Lantern Demonstration*). By Archibald M'Kendrick, F.R.C.S., Medical Officer jointly in charge of X-ray and Medical Electrical Department, Royal Infirmary, Edinburgh. 151

(*b*) Medical.

(1) *Disease of Nervous System.*

6. Tabes with Gastric Crises improved by Section of Posterior Nerve Roots. By Byrom Bramwell, M.D., F.R.C.P.E., Consulting Physician, Royal Infirmary, Edinburgh, and Alexis Thomson, M.B., F.R.C.S.E., Professor of Surgery, University of Edinburgh 13

(2) *Disease of the Circulatory System.*

7. Vagus Stimulation and Paresis in the Treatment of Cardiac Irregularities. By William T. Ritchie, M.D., F.R.C.P.E., Assistant Physician, Royal Infirmary, Edinburgh . . 184

PAGE

(3) *Disease of the Blood.*

8. Acute Myelocythæmia associated with Osteosclerosis. By ALEXANDER GOODALL, M.D., F.R.C.P., Physician, Royal Hospital for Sick Children (*with* 1 *Plate*) 141

(4) *Disease of Digestive System.*

9. Stomach: Position of, as Guide to Pyloric or Duodenal Difficulty. By WILLIAM RUSSELL, M.D., F.R.C.P.E., Physician and Lecturer on Clinical Medicine, Royal Infirmary, and Lecturer on Practice of Medicine, School of Medicine, Edinburgh . 20

(*c*) SURGICAL.

10. Treatment of Tuberculous Peritonitis in Adults. By FRANCIS CAIRD, F.R.C.S.E., Professor of Clinical Surgery, University of Edinburgh 86

11. Two Cases of Separate Acromion Process, with a Note on the Appearances presented in Radiographs of the Acromion Process and Upper End of the Humerus during Ossification (*Lantern Demonstration*). By JOHN W. STRUTHERS, M.B., F.R.C.P.E., Assistant-Surgeon, Royal Infirmary, Edinburgh (*with* 2 *Plates*) 179

12. Treatment of Simple Fractures. By CHARLES CATHCART, M.B., C.M., F.R.C.S.E., Surgeon, Royal Infirmary, Edinburgh 120

II.—DISCUSSION.

Vaccine Therapy. Introduced by Dr JAMES RITCHIE (*secundus*), Director of Laboratory, the Royal College of Physicians . 52

III.—EXHIBITION OF PATIENTS.

(1) *Illustrating Diseases of the Nervous System.*

1. Syringomyelia with Unilateral Hyperidrosis. Shown by Sir THOMAS R. FRASER 3

2. Hysterical Contracture. Case shown by Dr BYROM BRAMWELL 50

3. Tabes after Operation, Case of. Shown by Dr BYROM BRAMWELL 51

4. Tabes Dorsalis, Case of. Shown by Dr G. L. GULLAND . . 85

5. Myotonia Atrophica, Case of. Shown by Dr EDWIN BRAMWELL 161

6. Cerebral Deplegia, Case of. Shown by Mr CHARLES CATHCART 162

PAGE

(2) *Illustrating Diseases of Abdominal Organs.*

7. Ulcerative Colitis. Case shown by Mr ALEXIS THOMSON . 3
8. Dysentery, Chronic Tropical, treated by Short-Circuiting. Shown by Mr ALEXIS THOMSON 3
9. Dysentery, Case of. Shown by Mr FRANCIS M. CAIRD . . 50
10. Gall Stone, Case of. Shown by Mr CHARLES CATHCART . 139

(3) *Illustrating Diseases of the Skin.*

11. Leikoplakia, Case of. Shown by Dr DAWSON TURNER . . 49
12. Nævus, Congenital. Case shown by Dr DAWSON TURNER . 49
13. Xanthoma Tuberosum Multiplex. Case shown by Dr CRANSTON LOW 85

(4) *Illustrating Diseases of the Genito-Urinary System.*

14. Bladder, Extroversion of, Case of. Shown by Mr FRANCIS M. CAIRD 50
15. Nephrectomy, Case after. Shown by Mr HENRY WADE . 51
16. Calculus: Patient after Removal. Shown Mr CHARLES CATHCART 83
17. Entero-Vesical Fistula, Case of. Shown by Mr CAIRD . . 85

(5) *Illustrating Diseases of Circulation.*

18. Stokes-Adams Syndrome, Case of. Shown by Dr LOVELL GULLAND 184

(6) *Illustrating Diseases of the Extremities.*

19. Fracture: After-Results. Shown by Mr C. W. CATHCART . 51
20. Plastic Operation for Amputation of Finger. Case shown by Mr MILES 52
21. Humerus, Fracture of, Case of. Shown by Mr CHARLES CATHCART 84
22. Fracture of Femur. Case shown by Mr GEORGE CHIENE . 51
23. Sarcoma of Radius, Case of. Shown by Mr T. M. COTTERILL . 140
24. Osteomyelitis, Chronic, Operations for Case of. Shown by Mr SCOT SKIRVING 161

PAGE

25. Transplantation of Fibula, Case of. Shown by Mr Scot Skirving 161
26. Arthritis, Acute, Case of. Shown by Mr J. W. Struthers . 162
27. Humerus from Case of Syringomyelia. Exhibited by Mr J. W. Struthers 162
28. Knee-joint from Charcot's Disease. Exhibited by Mr J. W. Struthers 162

(7) *Illustrating Diseases of Head, Neck, Spine, Eye, Ear, and Throat.*

29. Glossitis, Case of. Shown by Dr Chalmers Watson . . 20
30. Plastic Operation for Restoration of Nose. Shown by Mr Miles 52
31. Œsophagectomy, Partial. Case shown by Mr Wallace . 139

(8) *Illustrating General Diseases.*

32. Antipyrin Rash. Case shown by Dr Norman Walker . 3
33. Lepomatosis, Case of. Shown by Dr John Eason . . 20
34. Salvarsan. Cases shown by Dr D. P. D. Wilkie . . 49
35. Specific Lesions treated by Salvarsan. Case shown by Dr D. P. D. Wilkie 49
36. Specific Ulcer, treated by Salvarsan. Case shown by Dr D. P. D. Wilkie 49
37. Cellulitis, Case of. Shown by Dr Henry Wade . . 52

(9) *Illustrating Constitutional Disease*

38. Gout, Case of. Shown by Dr John Eason . . 49
39. Rheumatoid Arthritis, Case of. Shown by Dr Chalmers Watson 50
40. Myxœdema, Case of. Shown by Dr J. L. Gulland . 84
41. Acromegaly, Case of. Shown by Dr G. A. Gibson . . 162
42. Myxœdema, Case of. Shown by Dr G. A. Gibson . 162
43. Lymphadenoma, Case of. Shown by Dr Lovell Gulland . 184

PAGE

IV.—EXHIBITION OF PATHOLOGICAL SPECIMENS.

1. Gout, Specimen of. Exhibited by Dr JOHN EASON . . 20
2. Glossitis, Specimens from a Case of. Shown by Dr CHALMERS WATSON 20
3. Humerus, from Case of Syringomyelia. Exhibited by Mr J. W. STRUTHERS 162
4. Knee-joint from Charcot's Disease. Exhibited by Mr J. W. STRUTHERS 162

V.—EXHIBITION OF MISCELLANEOUS OBJECT.

Mask for Administering Chloroform. Exhibited by Dr TORRANCE THOMSON 141

TRANSACTIONS

OF THE

MEDICO-CHIRURGICAL SOCIETY

OF EDINBURGH

TRANSACTIONS

OF THE

MEDICO-CHIRURGICAL SOCIETY OF EDINBURGH

FOR SESSION XC., 1911-12

Meeting I.—November 1, 1911

Dr Byrom Bramwell, *President, in the Chair*

I. Election of Office-Bearers

The following gentlemen were elected office-bearers :—*President,* Mr J. M. Cotterill ; *Vice-Presidents,* Mr Charles W. Cathcart, Dr John Playfair, and Dr Alexander James ; *Council,* Dr T. J. Thyne, Dr Edwin Bramwell, Mr J. W. Struthers, Dr R. J. Johnston, Dr George Hunter, Dr James Ritchie (*Secundus*), Dr Francis D. Boyd, Mr George Chiene ; *Treasurer,* Mr J. W. Dowden ; *Secretaries,* Mr Alexander Miles, Dr J. S. Fowler ; *Editor of Transactions,* Dr Chalmers Watson.

II. Election of Members

Frank E. Jardine, M.B., Ch.B., Evelyn Cottage, Penicuik ; Archibald Mackintosh, M.B., C.M., 50 Trinity Road ; J. H. H. Pearson, M.B., Ch.B., 12 Primrose Bank Road, Trinity, and George D. Mathewson, M.B., B.Sc., F.R.C.P. Ed., were elected Ordinary Members of the Society.

III. Treasurer's Annual Statement

EDINBURGH MEDICO-CHIRURGICAL SOCIETY'S ACCOUNTS

FOR SESSION 1910-1911.

INCOME				EXPENDITURE			
Entrance Fees	£7 7 0			Turnbull & Spears, printing Vol. XXIX. of Transactions, Postage, etc.	£74 1 1		
Annual Subscriptions	125 10 0			Reporting, Sessions 1909-10, 1910-11	11 11 0		
Annual Subscriptions, arrears	2 0 0			Rent of Hall	10 0 0		
Subscriptions for Transactions	1 5 0			Neill & Co., Billets and Postage	25 5 0		
Caledonian Railway Debenture Stock Dividends	13 3 8			Alex. Frazer, Microscopes, etc.	2 8 0		
Dominion of Canada 3½% Stock Dividends	9 17 10			A. & D. Padon, Stationery	1 16 6		
Interest on Deposit-Receipts	1 14 7			Doorkeeper	1 6 0		
	£160 18 1			J. M'Callum, Tea and Coffee	6 0 0		
				Collector	4 0 0		
				Petty Cash	0 11 11		
					£136 19 6		
Balance in Bank, November 1, 1910		57 0 8		Balance in Bank, November 1, 1911		79 15 9	
				Cash in hand		1 3 6	
		£217 18 9				£217 18 9	

STATE OF FUNDS.

At November 1910.				At November 1911.			
Caledonian Railway Debenture Stock (Purchase Price)	£484 11 6			Caledonian Railway Debenture Stock (Purchase Price)	£484 11 6		
Dominion of Canada 3½% Debenture Stock (Purchase Price)	298 2 6			Dominion of Canada 3½% Stock (Purchase Price)	298 2 6		
Balance in Bank	57 0 8			Balance in Bank	79 15 9		
				Cash in hand	1 3 6		
	£839 14 8				£863 13 3		

J. W. DOWDEN, *Hon. Treasurer.*

We have examined the accounts and compared them with the vouchers, and have found them all correct.

JAMES MILLER.
JAMES M. GRAHAM.

November 7th, 1911.

IV. Exhibition of Patients

1. *Dr Norman Walker* showed—
A case of ANTIPYRIN RASH.

2. *Sir Thomas R. Fraser* showed—
SYRINGOMYELIA with UNILATERAL HYPERIDROSIS.

Thomas D., 22, unmarried, a baker from Orkney, was admitted to the Royal Infirmary on 15th July 1911, with symptoms of spastic paralysis, affecting especially the left leg, which had existed for about three months. They were clearly present on his admission into Ward 26, and during several weeks thereafter; but they subsequently gradually lessened, and are now very slight. When he was first examined, however, it was also found that sensibility was definitely modified. The tactile, weight, and locality sensibilities were healthy and sharp; but over a large skin area thermal sensibility and pain sensibility were either absent or defective. The localisation was fairly symmetrical.

Among the parts not involved were the head and neck. It was observed that excessive sweating frequently occurred on the right half of the scalp, face, and neck, while the left half appeared quite dry. This unilateral hyperidrosis had existed for several months. It is readily induced by mental excitement and by the act of feeding; and pilocarpine causes sweating over these parts many minutes before it appears on the corresponding parts on the left side of the head, or elsewhere in the body.

3. *Mr Alexis Thomson* showed—

(*a*) Case of SHORT-CIRCUITING FOR CHRONIC TROPICAL DYSENTERY after failure to cure by appendicostomy. The patient is a man of 30, who had had malaria and dengue in Singapore, and the first attack of dysentery in Shanghai in the beginning of 1908. He improved under change of air, and then had relapses. There were sloughs as well as pus in the motions, and he lost over two stones in weight. Appendicostomy performed on the 29th December 1910, with improvement. Ileosigmoidostomy was done on the 30th May 1911.

(*b*) Case of ulcerative colitis for which an appendicostomy was performed twenty-two months ago. The patient is a man, aged 27, who had suffered from colitis for four years. He improved with four months' treatment in the Medical House and then relapsed. His colitis was of the ulcerative type, with a large amount of blood

in the motions. There has been great benefit from the irrigations through the appendix, but they have still to be continued.

V. Valedictory Address

By Dr Byrom Bramwell

Gentlemen, my period of office has now come to an end, and, before vacating this Chair in favour of the distinguished surgeon whom you have elected as my successor, I desire to express to you, as I did when you elected me, my most sincere and grateful thanks for the honour you did me in electing me your President. I would also like to thank the members of the Society for the kind consideration and courtesy which they have one and all shown to me, and the Council and Office-bearers for the help and assistance they have given me during my period of office. I need not say that in a society like this the President is to a large extent a figure-head, and that the real work of the Society, to a large extent, falls upon the secretaries. I would wish to thank very specially Dr Boyd and Mr Miles for the help and assistance I have received from them in conducting the affairs of the Society. As you are aware, Dr Boyd has to-night vacated the office of secretary, and you have elected Dr Fowler in his place; I think it is only due to Dr Boyd that we should express a very cordial vote of thanks to him for all the time and trouble that he has given to the affairs of the Society.

Nothing very striking or unusual has occurred in the Society during the past two years, but I think I may venture to say that we have done a great deal of very good and very valuable work.

We have had eighteen meetings—fifteen ordinary and three clinical meetings; the retiring President, as is customary, delivered a valedictory address; twenty-three specimens and 142 patients have been exhibited; there have been five demonstrations; twenty-six papers have been read; and there have been six discussions on special subjects.

Specimens.—Amongst the twenty-three specimens, eight were illustrative of diseases of the nervous, five of the digestive, four of the genito-urinary, two of the respiratory, one of the circulatory system, and one of the blood and ductless glands; one specimen was of medico-legal interest, and one an apparatus.

Five physicians, six surgeons, and two pathologists showed these specimens.

Patients.—Of the 142 patients shown, thirty-nine were illustrative of the diseases of the digestive system, twenty-eight of the nervous system, sixteen of diseases of the bones and joints, fifteen of diseases of the integumentary system, thirteen of the genito-urinary system; the remaining cases were illustrative of the diseases of the other systems and organs.

It is interesting to note that in this list the digestive system, most of the cases being surgical, occupies the first place.

Eleven physicians, fifteen surgeons, eight specialists—if I may so term the dermatologists, oculists, and aurists—and one general practitioner showed these patients.

Suggested Change in Place of Meeting.—The great majority of these 142 patients were shown at the three clinical meetings which were held in the Royal Infirmary. It has occurred to me that it would be an advantage if all the meetings of the Society could be held in the Royal Infirmary. I know by experience that this would greatly facilitate the exhibition of patients and specimens, for when I was secretary to the Northumberland and Durham Medical Society, we always held our meetings in the Newcastle Infirmary. I merely throw out this as a suggestion; it would not be easy to arrange, for it would be difficult to get the accommodation necessary both for the exhibition of specimens and for the general meetings. We want, I think, more room for the exhibition of pathological specimens and microscopes. It has occurred to me that so long as we continue to meet here, we might perhaps do away with the tea-room, and devote it to the pathological specimens and microscopes.

Demonstrations.—There were five demonstrations—one on the respiratory system, one on diagnosis, and three on therapeutic subjects. Two physicians, one specialist, and one general practitioner gave these demonstrations.

Papers.—The papers are, I need not say, a most important part of our work. There were twenty-six papers; they were pretty equally divided amongst surgical and medical subjects; a large number of them were of therapeutic interest. Eight physicians, seven surgeons, six specialists, and eight general practitioners read papers before the Society. It is gratifying to see that the general practitioners have taken such an important share in this part of our work.

Speakers on Papers.—Forty-five members (thirteen physicians, thirteen surgeons, ten specialists, nine general practitioners) and

one visitor took part in the discussions on these papers; these forty-five members spoke ninety times.

Discussions.—There were six discussions on special subjects. These discussions are a most interesting and valuable part of our work. The Council have tried to select such subjects for discussion as would be of general interest—of interest alike to the physician, the surgeon, and the general practitioner. Their hope was that the introducers of these discussions would indicate and emphasise the debatable points connected with the subject rather than refer to those parts of the subject which were recognised as settled and were common knowledge; with this object they have limited the introducer to twenty minutes, and arranged that these discussions should not occupy the whole evenings, but should, if necessary, be followed by one or more papers in the ordinary manner.

The first discussion, on *Syphilis and Marriage*, was introduced by Dr MacGillivray; nine members spoke.

The second, on *The Use and Possible Abuse of Athletics during the Period of Growth and Development*, was introduced by Dr Burn Murdoch; fourteen members spoke, and we had the advantage of the presence of several distinguished visitors, four of whom (Mr Smith of Merchiston Castle, Mr Tillard of Cargilfield, Mr Thomas of Edinburgh Academy, and Captain Dunlop of Loretto) took part in the discussion.

The third, on *The artificially prepared Hypnotics—their Use and possible Abuse*, was introduced by Dr Boyd; nine members spoke.

The fourth, on *Blood Pressure*, was introduced by Dr Gibson; eight members and one visitor spoke.

The fifth, on *Duodenal Ulcer—its Diagnosis and Treatment*, was introduced by Professor Caird; fourteen members spoke.

The sixth, on *The Part Played by the Upper Air Passages as Avenues of General Infection*, was introduced by Dr Logan Turner; fourteen members and two visitors spoke.

In the whole of these discussions, fifty members and seven visitors took part; they spoke seventy-four times. The speakers were divided as follows:—twelve physicians, twelve surgeons, two gynecologists, eight specialists, and sixteen general practitioners. It is interesting to note that in these discussions the general practitioners took an important part, and that in this, and indeed in all parts of our work, the division of labour between the physicians and surgeons was, practically speaking, equally divided.

On analysing the whole work of the Society, I find that ninety-five members have taken part in the business of our meetings; sixty of these may, I think, be considered active, and thirty-five less active members. As active members I would include those who have shown specimens, exhibited patients, read papers, given demonstrations, or introduced discussion; as less active members those who have merely spoken on papers or in the special discussions.

The great majority of the active members were necessarily physicians, surgeons, and specialists attached to one or other of the great hospitals. An analysis of the active members gives the following result:—Surgeons, nineteen; physicians fifteen; specialists, thirteen; general practitioners, thirteen.

Transactions.—The work of the Society has been published in the Society's *Transactions*, the last volume of which has been placed in our hands this evening. I am sure you will agree with me in thinking that the thanks of the Society are due to the Editor of the *Transactions* for the admirable way in which he has performed his work.

Finances.—The Treasurer has handed me a balance-sheet in which it appears that the finances of the Society are in a very satisfactory condition. Our expenditure this year was £136, 19s. 6d., as against £159, 18s. 1d. for the preceding year. Our balance in the bank is £79, 15s. 9d., as against £57, 0s. 8d. for the preceding year. Our total funds amount to £863, 13s. 3d., as against £839, 14s. 8d. last year.

Membership.—The total number of our members is now 444, 260 of whom are paying, and 184 are non-paying members.

Fourteen new members have been elected during the past two years; one foreign corresponding member has been elected, viz., Dr A. M'Phedran of Montreal, and two corresponding members in the United Kingdom, viz., Sir Wm. Watson Cheyne and Sir Thomas Clifford Allbutt.

Death Roll.—Our death roll has unfortunately been very heavy. We have lost one of our honorary members, and one of our corresponding members.

Dr Hughlings Jackson was one of the greatest neurologists whom the world has ever produced, a man of quite extraordinary genius and insight into the construction and mechanism of the nervous system. But he was not merely a scientific neurologist, he was a practical man; he was the first to demonstrate, by his

clinical and pathological researches, which he was carrying on when I commenced the study of medicine in the year 1865, the motor areas of the brain; it was his practical and clinical observations at the bedside which gave the impetus to all of the observations which followed on the localisation of the functions of the brain. He, too, laid great emphasis on the use of the ophthalmoscope. I merely mention these two practical points; it would take an evening to attempt to summarise in any adequate way the enormous benefits which science, more particularly the science of neurology, owes to Dr Hughlings Jackson. He died in his seventy-seventh year.

Dr Frederick Wm. Pavy, who died in his eighty-third year, was the leading authority in this country on diabetes.

Ordinary Members.—Fourteen ordinary members have died—eleven paying and three non-paying members.

Dr George Skene Keith was born in the year 1819 and died in January 1910, in the ninety-first year of his age. He was admitted a member of the Society in 1845. He is said to have been the last surviving medical member of the famous party that inhaled chloroform round Professor Simpson's table. At one time he had a great practice in Edinburgh in conjunction with his more celebrated brother, whom many of us here knew intimately, Dr Thomas Keith, the great ovariotomist.

Dr Skene Keith was probably unknown even by sight to most of the members of the Society, but he was known to almost everybody by his two books—"A Plea for a Simpler Life," and "Fads of an Old Physician." He was a man of strong personality and a great traveller. When aged seventy-eight, he went with his daughter to Spitzbergen, and when eighty he insisted on going unattended to Burmah. Two years later he was operated upon for cataract; his blindness was already in existence when he went unattended to Burmah.

Dr John Smith was born in the year 1825, and died in April of this year, in the eighty-seventh year of his age. He was admitted a member of the Society in 1856, and was its President in 1887.

Now, what shall I say of dear old Dr John Smith? He was a remarkable man. As a surgeon-dentist he occupied the very first position in the profession. When he commenced practice in Edinburgh, dentistry was at a very low ebb; he revolutionised dentistry; he actively assisted in the foundation of the Dental Hospital and School, and in getting a dental diploma. Dr John

Smith took a leading part in the foundation of the Royal Hospital for Sick Children. Dr John Smith was the first dentist to occupy the Presidential Chair of the Royal College of Surgeons.

But it was not so much as a professional man that we admired Dr John Smith, although, as I have said, he attained to the very highest position in his own rank of the profession, but because of his great natural gifts, and on account of his remarkable and lovable personality. Dr John Smith was a poet, artist, musician, and dramatist. None of us will forget the treat it was to hear him, when he still retained his fine voice, give that best of medical songs, which he himself composed, the "Clinical Examination"; none of us will forget his quaint appearance and genial personality which added an additional charm to his rendering of that delightful skit on the Edinburgh Royal Infirmary and the Edinburgh teachers. Dr John Smith was an artist, and I believe, if he had devoted his attention to art, he would have risen to eminence. Some of you may have seen his portrait of Dr Claud Muirhead, which hangs in Chalmers Hospital—a vigorous, forcible portrait; a man who could paint such a portrait late in life would certainly have attained to great eminence as an artist had he devoted himself to painting. Dr John Smith was a violinist; he was the author of three pantomimes which were played in the Theatre Royal. Lastly, he was for many years the Secretary and Bard of the Æsculapian Club, and contributed greatly to the success of the Æsculapian meetings; his racy and entertaining minutes are, of course, carefully preserved.

Dr Joseph Bell was born in the year 1837, and died on 4th October of this year, in the seventy-fifth year of his age. He was admitted a member of the Society in 1862, was Treasurer from 1872-80, Vice-President in 1880, and President in 1891. As you all know, he was descended from a very distinguished medical family, which for 150 years occupied a leading place amongst the physicians and surgeons of Edinburgh. Dr Joseph Bell was a prominent Fellow, Treasurer, and President of the Royal College of Surgeons; a distinguished surgeon and practitioner, beloved by his patients and nurses. He held many distinguished positions, and did splendid work in many of the medical and other institutions of our city; in particular he took an active interest in the Royal Infirmary, the Royal Hospital for Sick Children, the Royal Hospital for Incurables, the Edinburgh Eye Infirmary, and the Queen Victoria Jubilee Institute for Nurses. For many years

he was Assessor on the University Court, and I understand, during the whole of his long term of office, he never missed a single meeting until laid aside by his last illness. Dr Joseph Bell was a man of great mental ability and acuteness; for twenty-three years he most successfully edited the *Edinburgh Medical Journal*. He is said to have been the prototype of "Sherlock Holmes." Until struck down by a heart attack in February last he preserved in a very marked degree his vigour both of body and mind.

Dr Andrew Smart was born in 1824 and died in March of this year, in the eighty-seventh year of his age. He was admitted a member of the Society in 1865—the same year in which he published his researches on Rinderpest; it is said that he was the first physician to discover micro-organisms in the living tissue—in the blood of animals who died of rinderpest. Like Dr Joseph Bell, he presented remarkable juvenility. Those of us who were his colleagues in the Edinburgh Royal Infirmary knew that he was an old man, but none of us, I think, suspected that in 1906, when his term of office as physician came to an end, he was in his eighty-second year.

Dr Claud Muirhead was born in 1836 and died in June 1910, in the seventy-fifth year of his age. He was admitted a member of the Society in 1866, was Secretary from 1870 to 1876, and Vice-President in 1891. Dr Claud Muirhead was a man of wide medical knowledge and experience; he, for many years, held a very distinguished position as a general practitioner and physician in Edinburgh; and he did most valuable work as assistant-physician, physician, and manager of the Edinburgh Royal Infirmary. For many years Dr Claud Muirhead was Chief Medical Officer to the Scottish Widows' Fund, and one of the greatest living authorities on life assurance. In the words of the writer of his obituary notice in the *Edinburgh Medical Journal*, he was "an accomplished, dignified, and gentle physician, a true friend and Christian gentleman."

Dr Peter Maclaren was born in 1837 and died in May of this year, in the seventy-fifth year of his age. He was admitted a member of the Society in the year 1868, and was Vice-President in the year 1890. He was an able practitioner and surgeon, beloved by everyone with whom he came in contact, absolutely straight, upright, and honest, possessed of a fine sense of humour and unfailing cheerfulness of disposition. Like Dr Joseph Bell and Dr Andrew Smart, until the last year or two of his life he preserved

his youth in a most remarkable way. Maclaren was a man whom to know was to love.

Dr James Andrew was elected a member of the Society in 1869, and was one of its Vice-Presidents in 1899. Dr James Andrew was a well-known practitioner; during the course of his career he held several distinguished positions, notably that of President of the Royal College of Physicians.

Dr Alexander Bruce.—Now all of these distinguished men, with the exception of Dr James Andrew, lived the allotted span, some of them far more than the alloted span, of human life; we mourn their loss, we miss their presence, but we recognise that their removal was inevitable. It was different in the case of Dr Alexander Bruce, who was born in 1854 and died in June of this year, in the fifty-seventh year of his age. He was admitted a member of the Society in 1883. Dr Bruce was cut off in the full zenith of his powers, when his mental faculties were at their best; when he was full of energy and enthusiasm, and utilising for the benefit of science and mankind his wide pathological and clinical experience and knowledge. His death is a great loss to Edinburgh and the Edinburgh Medical School, as it is to science and medicine generally. He was a distinguished neurologist. Most of his best work was brought before this Society, and much of it was incorporated in his work on the "Mid and Hind Brain," and his "Topographical Atlas of the Spinal Cord." Perhaps Bruce's chief characteristic was his thoroughness, painstaking accuracy, and great reliability; though a fine clinician and successful consulting physician, his fame chiefly rests on his painstaking researches on the minute structures of the spinal cord and mid brain. Personally, Dr Alexander Bruce was so well known to every one here that I need not enumerate his great characteristics—we all liked him, respected him, and admired him.

In addition to the men I have already mentioned, other members of the Society whom we have lost by death are:—Dr Ormand H. Garland of Leith, admitted in 1873; Dr Stitt Thomson of Lincoln, admitted in 1877; Dr George Mackay of Bruntsfield, Edinburgh, admitted in 1878; Dr T. F. S. Caverhill, admitted in 1883; Dr Joseph C. Ross of Whithington, admitted in 1884; and Dr B. R. Craig Christie, Edinburgh, admitted in 1907.

Such a list of deaths is fortunately unprecedented; it is not only long in numbers, but it includes some of the most respected, most admired, and most valued members of the Society. It

remains for us who are left to try to profit by their example, to endeavour to follow in their footsteps, to worthily fill the vacant places they have left, and in our day and generation to do what we can to maintain and advance the science and practice of the great profession to which we all belong, to increase medical knowledge, and to maintain and add to the reputation of this great medical Society.

In conclusion, Gentlemen, let me again thank you for your kindness to me in this Chair, and allow me to congratulate my successor on being elected to this distinguished position; let me also congratulate the Society on having the opportunity for the next two years of serving under such a distinguished President.

Mr Cotterill, on taking the Chair, thanked the Society most sincerely for the honour they had conferred upon him in electing him their President, and expressed the hope that during his term of office the success of the Society might be maintained, success which, in spite of the modest disclaimer they had heard, had to no small extent been due to the way in which the duties of the Chair had been performed by his distinguished predecessor, Dr Byrom Bramwell. He would not detain them a moment longer except as President to express his own and the Society's great appreciation not only of the excellent work Dr Bramwell had done, but of the brilliant address they had just heard. No more difficult duty could have been laid upon anyone than to have had such a list to chronicle as he (Dr Bramwell) had to-night—a difficult duty which had been carried out, as they might expect, with very great success and with a great deal of feeling, which they appreciated very deeply.

He thought a formal vote of thanks ought to be given Dr Bramwell.

Sir James Affleck, in moving a formal vote of thanks to the retiring President, said Dr Byrom Bramwell's connection with the Society dated a long time back; he had been one of the most strenuous and exemplary members for at least three decades. The Society owed a great deal to him for the many valuable communications which he had made to it during that period. He (Sir James Affleck) would be very much mistaken if Dr Byrom Bramwell's interest in the Society ceased on his vacating the Chair.

Dr James Ritchie, in seconding the vote of thanks, said he had

had the honour of representing the Society on the Council during Dr Bramwell's term of office, and had had the opportunity of seeing the great ability with which he had presided, and the great interest and care he had taken in all the work which appertained to it.

Dr Byrom Bramwell thanked Sir James Affleck and Dr James Ritchie for their expressions of good opinion, and said he would continue to take the same interest, and he hoped an active interest, in the Society as long as health and strength permitted.

VI. Original Communication

A CASE OF TABES WITH SEVERE GASTRIC CRISES OF MANY YEARS' DURATION, IN WHICH SECTION OF THE POSTERIOR NERVE ROOTS HAS PRODUCED BENEFIT

By Dr Byrom Bramwell and Professor Alexis Thomson

The case which Professor Alexis Thomson and I are desirous of bringing before the Society is one of tabes, in which very persistent and severe gastric crises have been completely relieved by division of the posterior nerve-roots. We only intended to make this a brief communication, intending it to come at the end of Dr Russell's paper, and to occupy a few minutes; I must ask you therefore to excuse me if the communication is much shorter than you might have anticipated.

The patient is a man, now aged 33, a jockey by occupation, whom I have had under observation for a number of years—I showed him at a previous meeting of this Society.

The patient enjoyed perfect health until 1901, when he contracted a hard chancre. It was long in healing, and was not, he says, followed by any secondary symptoms, but there can be no doubt, I think, that it was a true syphilitic chancre. That is an important point in the case.

Ten months after the primary sore he began to suffer from attacks of pain in the stomach and vomiting, and these attacks have continued to recur with increasing severity until the time of the operation, to which I shall presently refer in detail, was performed.

Now the occurrence of the first symptom of tabes within ten

months of the primary sore is very unusual, indeed, so far as I know, unique, and the development of tabes at the age of 24 is a most unusual feature—the early age at which the disease developed was of course due to the short latent period between the chancre and the first symptoms.

It has been suggested to me that perhaps this was a case in which there was hereditary syphilis, and that it was not such an interesting case as it would appear to be; but there is no ground whatever for believing that he is the subject of hereditary syphilis. He presents none of the stigmata of hereditary syphilis. He had been perfectly healthy up to the time when he contracted the chancre. The family history is very good—father and mother, aged about 56 and 54 respectively, are alive and in excellent health; 3 brothers, aged 35, 23, and 18, and 2 sisters, aged 36 and 27, all in the best of health; there have been no deaths in the family, and his mother had no miscarriages. Neither in the family history nor in the man's personal condition is there the slightest suspicion of congenital syphilis.

We may take it, then, that the first symptom of tabes developed within ten months of the primary sore. A year after the gastric crises he began to notice his sight becoming dim, and that gradually increased until he became completely blind five years ago. A year after the sight became affected he began to suffer from severe lightning pains in the legs, and these pains continued until the operation was performed. The bladder became affected; the knee-jerks and Achilles-jerks were absent; the pupils showed the Argyll-Robertson condition; there was well-marked thoracic and ulnar analgesia. Charcot's disease of the right knee-joint developed. Up to the time that he became completely blind there was comparatively little ataxia, but after he became completely blind he became extremely ataxic—it is one of the most extremely ataxic cases of tabes I have ever seen—and the lightning pains and other symptoms greatly increased in severity.

Now this is another interesting point, because it was stated by Benedikt of Vienna that the development of optic atrophy in cases of tabes arrested the progress of the disease, that in cases in which optic atrophy was an early symptom ataxia was not developed and the lightning pains became less marked. That is not my experience. I have seen and reported several cases in which patients became extremely ataxic after blindness developed. In many cases, at least, optic atrophy does not have a retarding influence on the

disease; one might as well say that the lightning pains have a retarding influence, because in many cases in which lightning pains are prominent no ataxia is developed.

Another very interesting feature of the case is that lumbar puncture showed no abnormality in the spinal fluid. On 20th October 1910, there were only six lymphocytes to the field of 450 diameters, and the albumen was not increased; and on 5th October 1911, there were only eight lymphocytes to the field and the albumen not increased. This is a very interesting point, for it has been claimed that an excess of lymphocytes and an increased quantity of albumen is perhaps the most constant sign of tabes.

On 21st September and 5th October 1910, and on 5th September 1911, the Wassermann reaction was found to be negative.

Well, this man presented all the characteristic features of tabes —indeed one very rarely sees a case in which all the symptoms and signs are so well developed as they are in this case—but it is to the gastric crises that I want particularly to refer.

The gastric crises occurred within ten months of the primary sore, and they continued to recur at irregular intervals until March last (1911). The patient never went for longer than nine weeks without a gastric crisis—sudden violent stomach derangement, obstinate sickness going on for days—his last attack lasted for eighteen days—nothing would lie on the stomach. He became extremely emaciated during these attacks, passed little or no urine, had pain and great distress. He was treated with various remedies, and lately we had to give increasing doses of morphia, and even these did not give complete relief.

Under these circumstances I asked Professor Alexis Thomson to divide the posterior nerve-roots, representing the sensory nerves, distributed to the stomach. This was done on 17th March of the present year (1911).

Professor Alexis Thomson is unfortunately prevented from being present this evening, but he has sent me the following brief note of the operation, which was performed on 17th March, Mr George Chiene being present :—

"Gastric Crises of Tabes: Foerster's Operation.

"R. C., aged 32, jockey, admitted 16th March 1911, from Dr Byrom Bramwell.

"His case is peculiar in that his tabes developed within 12

months of the primary lesion of syphilis. He is totally blind from optic atrophy, and has got a Charcot joint in his right knee. The last time he was re-admitted to Bramwell's wards he was suffering from thrombosis in the veins of the leg.

"*Operation, 17th March* 1911, *with George Chiene.*—He took the anæsthetic very badly, crowing like a French railway whistle, and then when turned over on his face his breathing stopped and he was only kept going with the greatest difficulty by the skill of Dr Ross.

"The spinous processes had been marked out with silver nitrate by the house-surgeon, and I made two scratches right across the back at the level of the 6th and of the 9th dorsal vertebræ. The rectangular flap was then raised, the muscles cleared, and the laminæ divided, partly with Doyen's saw, partly with Horsley's forceps. Very little blood was lost, largely, I have no doubt, owing to his collapsed condition. When the dura was opened the cerebro-spinal fluid escaped under considerable pressure; there were filmy adhesions between the dura and the cord, evidently the result of posterior meningitis. This made the demonstration of the nerve-roots a little more difficult. Finally four pairs of nerves (7th to the 10th inclusive) were satisfactorily resected, some to a centimetre, others to a centimetre and a half. It was difficult to work with them, they were so thin and delicate. The dura was then stitched up and the muscles in successive layers; a strip of rubber dam introduced through a separate opening."

The wound took a long time to heal, no doubt due to the low vitality of the patient, but since it has healed he has remained absolutely well. It is now seven months since the operation, and he has not had a single gastric crisis, whereas for seven years before he has never gone for more than 7 or 9 weeks without a crisis, usually they were more frequent. (15th May 1912, the patient remains quite well; there has been no gastric crisis since the operation—a period of fourteen months.)

Another interesting point is that since the operation he has completely lost the lightning pains in the legs. This is difficult to explain, and it would almost appear that the operation has had a psychical effect, and that has prevented the recurrence of the lightning pains. Of course one may say, if that is so, Why is the relief of the gastric crises not merely psychical too? That is perhaps a possibility, but it is not a probability.

So far as I know, this is the first case in which this operation has been performed in Scotland, and I must say from the great success which has attended it in this case I should be inclined to urge it in some other cases of the same kind—obstinate and severe gastric crises which are not amenable to medical treatment. I have seen some other cases of the same sort ; I was speaking to the doctor of one of these patients, and he told me the patient had become a morpho-maniac.

Since the operation this patient's general health has greatly improved, as one might naturally expect ; and he says, and the nurses in the Infirmary confirm this, that he walks better. He certainly gets about better by supporting himself with his arms, but I cannot say myself that I see much improvement in the ataxia.

Discussion

Dr Gibson congratulated Dr Byrom Bramwell on the brilliant success of the operation in the extremely interesting case he had recorded. He (Dr Gibson) had listened with the greatest pleasure, almost delight, to some of the facts, because he had had many animadversions thrown at his head for holding that the ingoing afferent (sensory) nerve energy goes in through the sympathetic system. He thought the case they had just heard was ample proof of this contention.

While listening, he was reminded, too, of the observation of the late Professor Raymond of Paris, who discovered that by cutting the posterior nerve roots in cases of joint lesion, the resulting arthritic atrophy did not take place.

Personally he would be inclined to follow Dr Bramwell's example and operate in these severe cases of gastric crises.

Dr Edwin Bramwell said that he wished to congratulate the readers of the paper upon the brilliant result of the operation in the case which they had described. The gastric crises of tabes when frequent and severe were among the most distressing symptoms with which the physician had to deal. Morphia was often the only remedy which brought relief, and many patients became dependent upon the use of this drug. Any operative procedure which held out a reasonable prospect of cure was to be welcomed.

The operation of dividing the posterior roots for the gastric crises of tabes had been first performed by Küttner in 1908, on the

instigation of Otfrid Foerster of Breslau. The first case operated upon was that of a man who for six years had had severe attacks of abdominal pain and vomiting. Each attack lasted about a fortnight, and the attacks recurred at intervals of three weeks. The patient was "reduced to a skeleton," and was addicted to the morphia habit. The sixth to tenth dorsal roots on either side were divided. The crises disappeared after the operation, and there had been no recurrence 1½ years later. Foerster had summed up the reported cases in June of the present year; twenty-eight in all had been operated on: of these, three died as the immediate result of operation; two were not benefited; in twenty-three the operation was reported as successful; of these eight had relapsed, while in fifteen there had been no relapse; in nine of these the interval after operation was not stated; of the remaining six cases, in one (that above mentioned) there had been no return 1½ years after operation, while of the other five in none had more than five months elapsed.

In a Discussion before the Royal Society of Medicine in June of this year, Dr Purves Stewart had referred to a case of his operated on by William Turner in 1909, in which, when the patient was last heard of—a year after operation—there had been no recurrence. While time must elapse before it would be possible to correctly estimate the permanency of the results obtained, the speaker was of opinion that the procedure was indicated in cases such as that presented to the Society to-night, in which the severity and frequency of the crises made life unbearable.

Dr Church asked Dr Bramwell if in the early stage of his case there had been any antecedent hyperæsthesia over the areas of the posterior ganglia affected. He asked also whether shingles, which frequently accompanies tabes, had been observed, herpes zoster being sometimes a direct symptom of myelitis, and associated with the posterior cornua. Dr Church had a case in which shingles and rheumatoid arthritis were present together. Blisters down the side of the spine did good. In a case of tabes, would such blisters relieve the gastric crisis and render operation unnecessary? Dr Church thought that certain cases of tabes, shingles, and rheumatoid arthritis might be grouped together as far as association with the posterior cornua of the cord was concerned.

Dr Kenneth Douglas asked if it was not possible that the dis-

appearance of the pains was due to relief of the parts at the time of the operation, they being the result of a meningeal condition.

Dr Bramwell, replying, said he quite agreed with Dr Edwin Bramwell that it was only in really bad cases of gastric crises which had resisted medicinal treatment that one would recommend a severe operation like the one under discussion. Such cases were not common, but he knew of several others, and Dr Edwin Bramwell knew of others, in which nothing but these gastric crises had occurred for some years, and in which morphia has failed to give relief. Under these circumstances, if he were the patient he would like to have this operation performed—there is a chance of death, but life is not worth living with these continually recurring crises. The advice he gave his students when in a difficulty as to treatment was always to ask themselves—What would you recommend for yourself ?

Dr Douglas' suggestion he thought a valuable one. The condition of the parts was entirely altered by the operation, and it was quite possible that that might have had a very decided effect in mitigating the lightning pains.

Dr Church's remarks he (Dr Bramwell) failed exactly to understand. Personally he did not think there was any very close relationship between tabes, herpes zoster, and rheumatoid arthritis. Herpes zoster certainly was a lesion of the posterior root ganglia, but that was a totally different thing from the tabetic lesion. He did not know that in rheumatoid arthritis there was any similar lesion.

Meeting II.—November 29, 1911

Mr J. M. Cotterill, *President, in the Chair*

I. Election of Members

William Henderson Bryce, M.B., C.M., Lathallan House, Colinsburgh, Fife ; John Alexander Gray, M.B., Ch.B., 4 Wolseley Terrace ; James Lochhead, M.D., F.R.C.S. Ed., 10 Grosvenor Street ; A. Pirie Watson, M.A., M.B., Ch.M., F.R.C.S Ed., 79 Willowbrae Avenue, and H. L. Watson-Wemyss, M.D., M.R.C.P. Ed., 7 Coates Gardens, were elected Ordinary Members of the Society.

II. Exhibition of Specimens

1. *Dr John Eason* showed—

(1) Gout.

(*a*) Photographs of a man aged 70, a railway porter, who has been a heavy beer drinker. His father was an Englishman and by occupation a butler. The photographs show numerous gouty deposits of varying size; the largest, situated over the right olecranon, is the size of a golf ball. (*b*) From the same patient. Naked-eye specimen of a gouty deposit which ulcerated through the skin over a metacarpo-phalangeal joint It was found to be chiefly composed of sodium biurate and organic matter.

(2) Symmetrical lipomatosis.

(*a*) Photographs showing lipomatosis which affected the arms only. The swellings were not painful nor tender on pressure. They were irregular in form and distribution. The patient, a woman aged 80, was formerly obese, but at the time of observation was emaciated, and her hands showed evidence of rheumatoid arthritis. (*b*) Microscopic specimen showing the structure of the fatty masses.

2. *Dr Chalmers Watson* showed—

Specimens from a case of glossitis with general systemic infection due to Saccharomyces albicans.

The specimens comprised oral and gastric secretions and of cultures (Saccharomyces albicans), and microscopic specimens from the secretions of the mouth and from the faeces, from a remarkable case of thrush in an elderly subject.

III. Original Communications

1. THE POSITION OF THE STOMACH AS A GUIDE TO PYLORIC OR DUODENAL DIFFICULTY

(With Lantern Illustrations)

By William Russell, M.D., F.R.C.P., Physician and Lecturer on Clinical Medicine, Royal Infirmary, Edinburgh

Eight years ago I submitted a communication to this Society on the subject of hyperchlorhydria, in which I dealt with the symptoms, probable nature, and treatment of the condition. Last year I published a paper which again dealt with the subject, and there

is not time now to do more than state that hyperchlorhydria has generally come to be accepted as a definite clinical entity. I would add that it is also a generally recognised fact that gastric hyperacidity is often associated with gastric ulcer, that, in fact, gastric ulcer is probably nearly always due to such hyperacidity. It seems to me to be equally true that pyloric and duodenal ulcer are usually associated with this over-secretion, that in fact it is an important factor in their etiology. I do not attempt to argue these points to-night.

It is unnecessary that I should enlarge upon the question of duodenal ulcer. I think, however, that I ought to state that in my experience the perforation of acute duodenal ulcer is as rare as is the perforation of acute gastric ulcer. There is abundant operative evidence that such ulcers have healed; there is also much clinical evidence that under favourable circumstances they heal at least as readily as gastric ulcers heal.

It seems to me important to recognise that ulcer in the stomach and duodenum is not necessarily always of equal severity, that in some cases there is certainly a considerable depth of tissue destruction, whilst in others the loss is probably much less deep, and that in the latter the process of healing must be more easily and more quickly effected.

In all acute ulceration in these regions the ideal before the clinician ought to be to obtain rapid healing. How this can best be obtained need not be discussed, but the axiom stated must be kept prominently in view. The reason is that where rapid healing is effected no appreciably bad results remain, whilst if healing is slow there is not only prolonged suffering, but there follows so much thickening and induration that the stomach outlet or the narrow channel beyond it becomes greatly diminished in calibre, with the result that the gastric contents are unduly retained. A puckered scar, either at the pylorus or in the duodenum, leads to difficulty in the emptying of the stomach, and this difficulty in course of time leads to the changes in the position of the stomach to which I seek specially to direct your attention to-night. I have seen one case where the difficulty in the duodenum followed upon operation for perforation of a duodenal ulcer.

It seems to me to be essential to the correct understanding of such cases as we are dealing with to keep distinct in our minds the question of ulcer from the question of mechanical obstacle to the outgoing of the gastric contents. They no doubt often overlap,

but it is by realising these two distinct factors that we can hope to attain to completeness of differential diagnosis.

A few years ago I submitted to this Society a paper on "Congenital Pyloric Stenosis in the Adult," in which it was shown that this congenital narrowing led of course to difficulty in the emptying of the stomach; since then I have seen one example of a pylorus situated so high up in the abdomen that it suggested the conclusion that the stomach must have always worked at a great disadvantage, and that it was no matter for surprise that the symptoms of such difficulty should have become prominent under the strain of work in early adult life.

The difficulty in the emptying of the stomach is, of course, the cause of the retention of gastric contents, and it is the retention that is the cause of the symptoms.

The most evident result of a difficulty to the outgoing of gastric contents is, of course, "dilatation" of the viscus. So much is universally known, but the term is much too general and vague for the purposes of differential diagnosis in this region. There is a dilatation of the fundus; there is ptosis of the body of the viscus; there is ptosis of its inferior border; and there is overlying of the pylorus by the distended anterior wall of the stomach being carried far to the right of its normal position.

In all these, with the exception of the first and last, the position of the axis of the viscus in relation to its outlet is so altered that under the most favourable of conditions it can with difficulty be completely emptied.

To-night I cannot attempt to deal with more than one of these factors, namely, the position of what, for clinical purposes, I call the right border of the stomach.

The methods by which the position of the stomach is determined are visible peristalsis, percussion, succussion, and auscultatory succussion. The position of abnormal stomachs can be determined without X-ray examination, although such examination is interesting and confirmatory in certain instances.

I shall now show you outline figures of the position of the stomach in fourteen patients, thirteen of whom were operated on. All of the thirteen made excellent recoveries. This is merely a selection of recent cases. These patients were operated on by Mr Cotterill, Mr Wallace, Professor Caird, and Mr Struthers.

The outline figures were traced directly from the body by means of tracing paper, the position of the mammæ, the costal margin,

the umbilicus being indicated, and usually the pubes and the anterior iliac spines also.

Case A was a man of 60 years of age. At the age of 20 he began to have symptoms of hyperchlorhydria ; at the age of 40 he had symptoms of duodenal ulcer, and was treated in the Royal Infirmary for gastric dilatation, and taught to wash out his stomach. He had done this for twenty years, but even with two washings a day his discomfort was so great that he was sent to me. The annexed is a tracing of his stomach. There was great stenosis in the first part of the duodenum. He did very well.

Case B was a man of 48 years who had suffered from his stomach for 11 years, but was well nourished and remarkably healthy looking. The stomach is not a large one, and it is some distance from the umbilicus, but its right border is considerably to the right of the middle line. There was a small thickened scar or ulcer at the pylorus. He did well and got entire relief.

Case C.—A man aged 45 had shown symptoms for only a few months, but from the position of the right border of the stomach we decided on a gastro-enterostomy being done. At the operation there was a thickening at the pylorus which the surgeon thought was not malignant, and did not do a pylorectomy. Here it is to be noted again that the stomach was not very large, and was far above the umbilicus, but that the right border was far to the right.

Discussion

Professor Caird drew attention to the point that at a laparectomy the stomach has been washed out, is empty, and lies contracted, so that its centrum need not always strictly correspond to the outline furnished by the physician.

He had found the pylorus more frequently in the mid line than was generally recognised, and in cases of dilatation where the pylorus was fixed, the pyloric centrum overlapped it. In some cases of malignant disease of the pylorus, the duodenum might be elongated with the neoplasm freely mobile and well to the left of the umbilicus, while in other cases the tumour was fixed and hidden under cover of the liver.

Examination of the stomach should be carried out in the sitting and upright position as well as with the body recumbent. Cases were met with where the patient had discovered a tumour as he

stood upright leaning against a desk, although it was not easy to find the growth when in the recumbent attitude.

In regard to test meals it was advisable to employ more than one.

Dr Gulland said, as far as he could gather, Dr Russell's point was that the permanent projection of the stomach to the right was an indication of pyloric stenosis, or at least of pyloric difficulty, but in his experience the pyloric portion was quite often well over to the right in atonic cases as in obstructive ones. It was quite likely that Dr Russell was perfectly right to have these patients operated on, but he did not think that the actual shape of the stomach had, or should have had, anything to do with the decision for operation. The point on which that decision ought to be based was that of retention of gastric contents beyond the normal time, and that could be easily estimated by other means. He had long used the auscultatory pulpation described by Dr Russell as a means of estimating the size of the stomach, and had a great belief in its accuracy and usefulness. As far as he could gather, experienced radiographers were by no means so sanguine about the value of the bismuth test meal as Dr Chalmers Watson. It was a valuable means of visualising the condition of the stomach, but results quite as good, and probably more reliable, were obtained by other methods. One factor which made a difficulty in the use of the bismuth was its weight, and the necessity of examining the patient in the erect position, which is not the customary one for examining the abdomen. He quite agreed with Dr Russell in regarding hyperchlorhydria as a clinical entity, not a disease, but a very important symptom of many conditions.

Mr Stiles was interested in Dr Russell's paper from the anatomical as well as the clinical aspect. In confirmation of Dr Russell's observation that extension of the stomach note considerably to the right of the middle line pointed to pyloric obstruction he (Mr Stiles) wished to point out that this is exactly what always happens in cases of congenital obstruction of the pylorus. With regard to the ordinary clinical examination of the stomach versus radiography, he felt that unless those who interpreted the skiagrams were familiar with the variations in the topography of the viscera under the varying conditions both of health and disease, in many cases the photographs were just as likely to deceive as to

assist the practitioner. It was only by constantly comparing the X-ray pictures with the conditions actually found at operation that one could form a correct estimate of their value. If the patient suffered from chronic constipation it often happened that the stomach, and even the pylorus, especially in the erect posture, were markedly dragged downwards by a loaded colon, and in some of these cases the stomach was blamed when the colon was really the organ chiefly at fault. In a paper recently published in the *Annals of Surgery* (Pyloroptosis: Gastric Atomy as the Original Cause of Neurasthenia—and its Cure, by Archibald Maclaren and Louis E. Dougherty, *Annals of Surgery*, Sept. 1911), the writer maintains from his X-ray examination that in the erect posture the pylorus is situated opposite the 4th or 5th lumbar vertebra, and that it is often a pelvic organ. In the horizontal position on the operating table Mr Stiles had never seen it lower than the 3rd lumbar vertebra. A few days ago Dr Price brought him a skiagram of a patient with a dilated and proptosed stomach in which the pylorus was shown to be opposite the 4th lumbar vertebra. When the abdomen was opened with the patient in the horizontal position, it was found to be at a considerably higher level.

With regard to the treatment of dilatation of the stomach, he did not think it mattered whether the patient had an organic obstruction of the pylorus or not. The question was, Was the stomach able to empty itself? If not, then he considered it ought to be drained, and the proper way to do this was to perform a gastroenterostomy, and at the same time close the first part of the duodenum. He had now done nearly twenty of these operations, with benefit in every case, and in none had there been any regurgitant vomiting. In a good many cases of gastroptosis, either caused or aggravated by chronic constipation, the loaded colon, by dragging on the stomach, caused a mechanical difficulty at the pylorus, especially if the latter remained fixed.

Dr Chalmers Watson thanked Dr Russell for his extremely interesting and concise demonstration. He could not agree with the author in regarding hyperchlorhydria as a clinical entity; it was in the speaker's mind more a manifestation of a particular dyscrasia than a definite disease. In quite a number of cases which presented clinically the features of hyperchlorhydria, no excess of acid was found on gastric analysis.

With regard to the percussion of the stomach, the speaker agreed with those physicians who regarded percussion, by itself, as comparatively valueless, and in certain cases he relied more on the results of radiography.

Dr W. T. Ritchie asked if Dr Russell regarded inflation of the stomach as of aid in determining the position and size of the organ. He himself considered inflation as useful in this respect; but, of course, there were certain cases in which inflation was contra-indicated. The inflated stomach could frequently be delimited more accurately by simple percussion than by auscultatory percussion. Inflation, however, was inferior to the bismuth meal, or the kontrastin meal, in determining the position and size of the stomach. During the last four months, while working in the new Clinical Medicine Research Laboratory, he had learned much regarding the form of the stomach. The X-ray examination of the stomach may confirm the results obtained by the usual clinical methods, but the latter were certainly less reliable than the picture observed on the screen.

Dr Stewart Fowler joined with Dr Chalmers Watson in thanking Dr Russell for his interesting communication. He would like to know if Dr Russell had seen any cases of dilatation of the stomach in comparatively young children—between the ages of 3 and 10 years. The interesting point was whether these cases were due to congenital obstruction of the pylorus. He (Dr Fowler) had seen two cases in which the symptoms were quite characteristic—stomach enormously enlarged, vomiting, well marked peristalsis, and some obstruction; the first case was operated on by Mr Stiles some five or six years ago, and a healed tuberculous ulcer was found; the other case was seen this summer—a child of 6 who had had symptoms since the age of 3; in this case a bismuth meal was given and went right down into the pelvis; the parents did not wish an operation, so nothing was done. They were, of course, quite familiar with congenital obstruction in infants; but he had never seen a case in which he was sure the condition was congenital in older children. The literature revealed only very doubtful statistics in children after infancy. This point was interesting and comparatively little known.

Mr Miles said the thing which struck him in Dr Russell's cases

was not so much that the whole stomach was over to the right, but that the anterior wall had been pulled over on to the top of the pylorus, and the pylorus, being fixed by adhesions, could not be moved. On pulling the stomach back the pylorus was revealed not very far from its normal position.

The President thought that as there was another interesting paper to be read it was now time to apply the closure, and called upon Dr Russell to reply.

Dr Russell, in replying, said he entirely agreed with Mr Stiles that the difficulty was mechanical and should be overcome by mechanical means. With regard to the other speakers there was not much he could say. They could hardly enter upon the discussion of hyperchlorhydria on this occasion, but he would point out that none of the speakers realised that he was giving them results of practically a new method of investigating the stomach; it was not done by percussion and auscultatory percussion, it could not be done by these methods, they were misleading and practically useless. Percussion as one means of investigating the stomach was most valuable, for there was no large stomach in which one could not determine precisely and accurately the position of the fundus by this means, but the method he had specially worked out was succussion. One got this succussion wave with air and fluid contents in the stomach, and in dilated stomachs there was always air present, and if no fluid was present, it was easy to put it in. By producing the succussion wave the lower border of the stomach and also the right border could be absolutely determined; sometimes the position of the lesser curve could also be determined, and very often the position of the fundus, by getting the wave back up into the fundus. This method had not been worked out by many others besides himself; it was quite clear from the discussion that none of his colleagues had paid any attention to it.

Dr Gulland said he had used it for years.

Dr Russell was only too glad that some of his colleagues had used it, but they had not said so.

Dr Gulland said they had taken it for granted.

Dr Russell said as far as he knew this method was not taught in the Edinburgh School.

Mr Stiles said they did that (demonstrating the action).

Dr Russell said he knew they got splashing, but he was not talking of splashing; he was referring to a means by which in a case of dilatation of the stomach the outline of the viscus was marked out. Some of his colleagues seemed to have done this before, but he was not aware of it; he had been waiting to hear it mentioned. The X-rays had been referred to, percussion and auscultatory percussion had been referred to, but there had not been a word about succussion. He was glad to think some of his colleagues had employed this method, but those members who did not know it—if there were any such present—might be assured that they could determine the position of the stomach by this means, and accurately mark out its limits, and that the method would be of much practical value to them.

When the right border of the stomach was over to the right and could not be rectified by the physician it indicated that the patient should be sent to the surgeon for operation.

The President said the Society was deeply indebted to Dr Russell for his interesting and suggestive paper. In the case referred to that he (the President) had dealt with, the obstruction was just on the stomach side of the pylorus and consisted of a considerable amount of thickening which made one suspicious of malignant disease. A gastroenterostomy was done; the case was still under observation, and he was glad to think it was not going to break Dr Russell's record.

2. VACCINE THERAPY

By James Ritchie, M.D., Superintendent of the Laboratory of the Royal College of Physicians, Edinburgh

In considering the question of vaccine therapy it is well to have a clear idea of the scientific principles underlying the use of vaccines in the prophylaxis and treatment of disease. As an initial consideration, here, we must differentiate between the two great groups of bacterial diseases, namely, the bacterial intoxications and the bacterial infections proper—the true infections. In the

bacterial intoxications, of which diphtheria and tetanus are the best examples, the bacterial multiplication is confined to superficial parts of the body; the organisms do not pass into the blood, and the pathogenic effects are originated by fluid poisons formed at the focus of bacterial growth and absorbed into the body. These fluid poisons are readily formed by the organisms when growing in artificial cultures, and they can be obtained in an impure condition by filtering the cultures free of bacteria. In the true infections, on the other hand, the foci of bacterial multiplication may be superficial, as in streptococcus infections of the tonsils, but usually occur within the body tissues. The outstanding local lesion here is inflammation, frequently accompanied by general disturbances indicated by fever, loss of weight, etc. An important fact is that, whatever the cause, the effects produced are similar, there being no essential pathological difference between the fever arising in a boil caused by the staphylococcus pyogenes, in a pneumonia caused by the pneumococcus, and in that seen in the course of tuberculosis. There is, in other words, no evidence of any specific effect on some particular tissue comparable with the disturbance of the function of the grey matter of the spinal cord seen in tetanus.

It is essential to note that at present nothing is known of the processes by which the organisms concerned with the true infections originate general disturbances in the body. It is usual to attribute such disturbances to the elaboration of toxins, but such a phraseology must only be used with the mental reservation that so far as our present knowledge goes, no scientific definition of the toxic process can be given. In this connection it may be stated that in cases of such organisms as those alluded to, namely, pyogenic cocci, pneumococci, the tubercle bacillus, no free formation of fluid toxins can be observed in cultures. The so-called toxic effects are, however, associated with the breaking up of the protoplasm of the bacterial cell. This occurs by autolysis in cultures in which individuals are dying, and it can be brought about artificially by treating bacteria with various physical and chemical agents. Similar processes, there is evidence, occur in such organisms when growing in the tissues. Here also organisms are constantly dying, and with death the cohesion of the protoplasm becomes diminished. It may indeed be laid down as a general characteristic of a true infection that the bacteria multiply in the tissues, that many die, and that the protoplasm in a more or less

particulate condition may pass into the neighbouring lymphatics and thence into the general circulation.

From the standpoint of present-day pathology the relationship to apparently toxic effects of alterations in bacterial protoplasm is complicated by the facts recently observed regarding the hyper-sensitiveness which, under certain circumstances, the body may manifest towards almost any foreign albumen introduced into it. Thus white of egg can be injected daily into a rabbit without effect, but if a period of ten days elapses between the first and second dose, in a large number of instances the animal will die in a few minutes. There is thus the possible complication of the apparently toxic effect being due, not to any inherent toxicity of the protoplasm, but to an alteration in the tissues of the host whereby these become specially susceptible to the action of substances which, under other conditions, might be innocuous. If these facts be borne in mind no harm results from the convenient application of the term "toxic action" to the processes at work in the true infections.

The next point for notice is the distribution of living bacteria in the body in the true infections. The general statement may be made that usually such distribution is focal, there being either a single focus or several points of multiplication. Even in many conditions which are described as septicæmic, for example puerperal septicæmia, the main source of danger lies in the occurrence of bacterial multiplication within the uterus. Great care is necessary in the use of the term "septicæmia." In its strictest application the word should denote a condition where active multiplication of bacteria is taking place in the blood, and where this constitutes the essential danger to life. This is an uncommon occurrence in human infections, and is chiefly seen in plague and in certain excessively rare streptococcal infections. In human disease the commonest occurrence is the focal multiplication alluded to, in the course of which a few organisms may escape and be found in the circulation, such "escapes," as they may be called, being frequently observed, for example, in pneumonia, typhoid fever, etc. That the number of organisms is small is indicated by the fact that when a bacteriological examination of the blood is called for it is customary to take a relatively large quantity, namely, 5 to 10 c.c., for the performance of the test. The survival of the escaping organisms in the blood is probably usually of short duration—in pneumonia, for instance, although escape is common, the development of secondary foci outside of the lung is relatively rare.

From our present standpoint it may be said that these living organisms escaping from the focus of infection, acting along with the more or less particulate autolysed products of dying bacteria, are of importance in stimulating the general resistive capacities of the body to which allusion will presently be made.

We may now proceed to ask how recovery from infective disease occurs. If all infective disease is of a toxic nature in the sense in which the term has already been defined, it is manifest that recovery might be dependent on the fact that a non-lethal dose of the effective poison had been absorbed. There is, however, evidence that when infection occurs a mechanism in the body is stimulated whose activity results in a situation inimical to the life of the invading bacteria. Such evidence is derived from a consideration of experiments in which the injection into an animal of living or even dead bacilli in non-lethal doses causes the development of resistance to subsequent infection with the noxious agent in what would ordinarily be a fatal amount. There has been endless controversy as to the processes which go on in the body of such an immunised animal, and which are responsible for the appearance of this new quality of resistance. For our present purpose it is enough to say that the introduction of any foreign proteid into an animal's body stimulates some mechanism whose possible normal functions are either the utilisation of such proteid to meet the food requirements of the body or the conversion of proteid which would be harmful into a harmless or inert substance. One line of proof for the existence of such a mechanism is based on the fact that the introduction of foreign proteids is very frequently followed by the appearance of new properties in the body fluids, the presence of which is capable of physical demonstration. The substances carrying these properties are usually referred to as antibodies to the particular substance introduced, and an outstanding feature of such substances is the possession of a high degree of specificity, that is to say, that any given substance stimulates the production of an antibody which, generally speaking, is only capable of acting on the substance which gave rise to it. Taking bacteria as an example of harmful proteids, the antibodies which appear may for our present purpose be looked upon as chiefly belonging to two groups. These are—*Firstly, bactericidal bodies.* Thus when cholera vibrios are introduced into an animal its serum develops the quality of killing cholera vibrios *in vitro*. *Secondly, opsonins.* These are bodies which render bacteria more

liable to be ingested by the phagocytic cells of the body. Thus if human leucocytes be washed free of serum and brought in contact with an emulsion of staphylococcus pyogenes aureus in normal saline the leucocytes will manifest little or no tendency to take the organisms up into their protoplasm, but if the cocci have previously been subjected to the action of the serum of an animal injected with staphylococci, the leucocytes will manifest active phagocytic function and englobe the organisms in large quantities. It may be stated in passing that the sera of untreated animals not infrequently manifest both bactericidal and opsonic qualities, but as some differences probably exist between such normal bactericidal and opsonic substances, it is well for the sake of clearness to confine our attention to those which develop as the result of previous treatment with bacterial products.

Whether in any particular case the resistance developed during an immunisation is directly due to the circulation of such antibodies in the fluids of the living body must be looked upon as still undetermined, but it is at any rate sufficiently established that the presence of such substances in the serum is an index that the living body is in a position to resist bacterial inroads. It is extremely important to notice in different affections differences in the relative importance attached to the development of a bactericidal quality on the one hand, and of an opsonic quality on the other, though both may be co-existent in any particular case. Thus with reference to the typhoid bacillus the development of a bactericidal serum readily takes place although opsonic qualities are also present. In the case of infection with the pyogenic cocci, pneumococci, and tubercule bacillus, etc., the development of bactericidal qualities is in the background, and the outstanding feature is the development of opsonic properties. The great contribution of Wright to the immunity question consists in the recognition of this fact, which is all the more important in view of the organisms mentioned being by far the most important sources of bacterial infection in man.

In applying these facts to explain the good effects following from the prophylactic or therapeutic uses of vaccines we may make the general statement that when the body is successful in preparing itself for a bacterial invasion or for resisting such an invasion when it occurs, it does so in consequence of the activity of a mechanism which acts by throwing into the body fluid substances inimical to the vitality of the infecting bacteria.

The existence of an antagonistic mechanism has an important bearing on natural recovery. Keeping in mind the essentially focal nature of infection, it is to be recognised that the bacterial protoplasm passing into the body not only produces toxic effects but is the means by which the antagonistic mechanism is stimulated. It is difficult to disentangle the two processes—the harmful and the beneficent—in fact we do not know how far a moderate pyrexia may not be an indication of the development of resistance. Probably, however, the absorption of a small amount of bacterial protoplasm favours resistance, while a large dose submerges the reactive process. In any case it is by auto-inoculation, as Wright denominates the phenomenon, that natural recovery most likely comes about.

These constitute the chief pathological facts bearing on the subject of vaccine therapy. We may now pass to consider the constitution of vaccines and their probable mode of action. In the earlier attempts to combat therapeutically the effects of true infections recourse was had to serum therapy. Here some one of the larger animals was subjected to a long series of injections with the causal bacterium, and its serum was used after the analogy of the antitoxic sera employed in the treatment of bacterial intoxications for the purpose of combating the effects of the true infections in man. The principle underlying this treatment was the passive transference of the immunity developed in the animal treated to aid the human organism in combating the effects of the bacteria growing upon it. In vaccine therapy the principle is entirely different; the object here is actively to stimulate the capacities of the human organism so as to enable it to resist infection if this should occur, or to aid it in throwing off an infection already established. The means adopted is the injection of the causal organism modified in some way so as to prevent its actual multiplication in the tissues. Such modification usually consists either in killing it or in employing some process which disintegrates its protoplasm, the former being the method most commonly in use. The procedure is to take a well-grown culture on sloped agar and to wash this off with a small quantity of normal saline. The bacillary emulsion thus formed is well shaken, preferably in a shaking machine, in order to disintegrate any masses of bacteria present, and get so far as possible a suspension of single bacterial cells. The number of bacteria present in a unit volume is then estimated. The organisms are then killed at as low a temperature

as possible, usually from 60° to 65° C., as there is evidence that a vaccine exposed to higher temperature may lose a certain amount of its efficiency. The amount of vaccine it is desired to give is placed in a sterilised ampoule which is sealed. For use the point of the ampoule is broken off. The contents are sucked up into a sterile hypodermic needle and injected subcutaneously into the supraspinous or subclavicular regions over the deltoid or into the flank, the skin having previously been purified with lysol or iodine. Injections into the dorsal regions should not be made when patients are lying in bed.

In the preparation of a vaccine a most important point is the standardisation, the dosage being reckoned in terms of the number of bacteria injected. In the case of ordinary vaccines this is effected by counting, by an appropriate technique, the number of bacteria in a unit volume. The only case where, instead of killed bacterila cells, the disintegrated bacterial protoplasm constitutes the vaccine, is that of the tubercle bacillus. Here the objection to the use of bacteria which have been merely killed is that these, if injected, may give rise to local granulomata resembling those caused by living bacilli. The vaccine is therefore prepared by grinding tubercle bacilli in an agate mill in saline solution until on centrifuging no visible deposit occurs. Such preparations constitute the two tuberculins chiefly used—Tuberculin R. and the Tuberculin Bacillary Emulsion. These differ slightly in their composition, and the latter is generally employed. Koch's Old Tuberculin, which was essentially a glycerine emulsion of autolysed tubercle bacilli, is little used for vaccination work. With tuberculins the doses are reckoned in terms of the weight of the dried bacillary mass with which the making of the vaccine was started.

We may now look briefly at the theoretical views held as to the *rationale* of the efficacy of vaccines. These will be understood if the principles enunciated at the commencement of this paper be kept in mind. As has been stated in the true infections, bacterial protoplasm in a more or less particulate condition is probably constantly being absorbed from the focus of active multiplication. The resisting mechanisms of the body is thereby stimulated, and the death of the living bacteria in the local focus may be caused and recovery brought about.

Now a vaccine consists of dead and often broken up bacteria, and is thus composed of protoplasmic material analogous to that passing into the body from a focus of infection. The stimulation

of the resisting mechanism which occurs in untreated disease therefore takes place. If a vaccine be prophylactically applied the body fluids as a whole are rendered inimical to bacterial life, so that when organisms gain entrance they find a body prepared to resist their inroads, and either cannot multiply at all or only do so to a limited extent. Where a vaccine is used therapeutically the difficulty may appear to present itself that it is absurd to introduce further doses of bacterial poison into a body which is already suffering from the effects of the circulation of such substances. If, however, the focal nature of the infection be borne in mind, it is evident that while under ordinary conditions the body may be in a position just to prevent the infection becoming generalised, it may not be capable, as it were, of carrying the war into the enemy's camp, so as to destroy the bacteria which have already gained a footing. This may be effected, however, by calling into play through a vaccine reserve sources of the general resisting mechanism, the stimulation of which may so flood the local focus with antibodies as to kill off the invading bacteria. Several facts supporting this view are known. Thus there is evidence that in many cases mechanical factors may prevent antagonistic substances reaching a focus of infection. For instance, the pus of an acute abscess has been shown to be poor in antibodies, but when the local tension is relieved by incision the fluids draining from the wound may show evidence of containing antagonistic substances. The determination of lymph from the surrounding parts into the abscess cavity is looked upon as responsible for this alteration, and the gradual sterilisation of the abscess which follows evacuation of pus is also thus accounted for. It is also known that as the result of the use of a vaccine therapeutically a rise takes place in the content of the blood in antibodies, and thus the explanation just given of the curative effect produced by vaccine therapy in an already established infection is probably proximately correct.

We may now pass to consider the sequence of events which occurs when a vaccine is injected. The important fact here is that the beneficial effect is not at once attained, a definite time being necessary for the formation of antibodies to take place. In cases where the development of these can be followed with the greatest accuracy it is found that very little change can be observed in the body for from 36 to 48 hours, but when this period has elapsed the substances may appear in the blood serum in considerable quantities almost by crisis. There is evidence that

during the preliminary period not only may no evidence be obtainable that the antagonistic mechanism is at work, but it may be true that after the injection of a vaccine the body may be more than usually susceptible to invasions by the bacteria. This is usually referred to as the occurrence of a "negative phase." In successful vaccination this phase is followed by that of free antibody formation, usually referred to as the "positive phase." The existence of the negative phase constitutes one great difficulty in the therapeutic application of vaccines, and especially in chronic infections its presence is difficult to detect by clinical observation. The importance of the recognition of the negative phase lies in this, that in chronic infections it may be unduly prolonged, and that if, during such a period, a fresh vaccination be practised, the diminution in resistance may be such as to favour an active proliferation of the bacteria, and thus lead to an increase instead of a diminution in the pathological processes present.

The great difficulty underlying vaccination procedures for a therapeutic end is, however, that the resources of the antagonistic mechanism of the body are, when bacterial protoplasm is concerned, exceedingly limited, and here the importance of differentiating between the bacterial intoxications and the true infections comes to the front. It is easy when working with diphtheria toxin to immunise an animal so that it can successfully withstand the injection of many thousand times the amount of poison which, in its untreated condition, would have been fatal, but no similar statement would be true of injections of dead bodies of a bacterium. Here it is with the greatest difficulty and with constant unexpected and inexplicable failures than an animal can be immunised against even a small number of minimal lethal doses, and this limitation of the antagonistic mechanism must always be kept in the foreground in the use of vaccines. It is possible so to treat an infected organism that it may be capable of killing invading bacteria, but there is very little reserve of capacity to fall back upon, and it is easy to pass from success to failure and to do more harm than good by vaccine treatment.

The question thus arises of how the effects of any vaccination procedure are to be judged of so that the treatment may be followed by the maximum of good and by the avoidance of harm. An important point here is that in different infections the degree of harm done may vary. Thus, as in many suppurative skin conditions where general infection practically never occurs, the effects of an

overdose of vaccine merely means a delay in the cure, and no permanent harm is done. Where, however, as in tuberculosis, there is ever present the risk of a local infection becoming generalised, any mistake may be of grievous import to the patient. This danger is emphasised by Wright and his school, but it would be of much interest if those with experience of tuberculin injections would discuss how frequently an unusual reaction follows gradually increasing doses of tuberculin, and further, how far these, when they do occur, interfere with the ultimate progress of the patient. In cases of ordinary disease, where the lesion treated is superficial, the clinical progress of the case is a measure of the success or failure of the treatment. Thus a fresh outcrop of boils after a dose of a vaccine is an indication that this particular administration has not been justified. In certain less superficial conditions clinical evidence may constitute a sufficient criterion. Thus, in cystitis due to the bacillus coli, diminution in pain and in frequency of micturition and the disappearance of pus from the urine form valuable indications of the success of a vaccination. The most difficult, and at the same time the most important, cases are where localised tuberculosis is being treated. Here the clinical course is so chronic, the change from week to week, or it may be from month to month, may be so small, and the fact that under ordinary treatment improvement may occur, all make the application of vaccine therapy excessively difficult, and it is in these cases that the establishment of more exact criteria of progress is most to be desiderated.

It is thus in this connection that the question of the possibility of judging of the effects of a vaccination by studying the changes in the content of the serum in antibodies arises. As has already been stated, the opsonins probably form the most important of these substances in ordinary human infection, and especially in tuberculosis. Of the existence of such substances there is no doubt, but great difficulties have arisen as to the significance to be attached to variation in the amount of these bodies in the serum during a natural illness or during an immunisation process. First of all the reliability of the technique by which they are measured has been challenged. This technique consists in the estimation of the opsonic index in which the effect of patient's serum in sensitising bacteria is compared with that of a healthy individual. As the essential procedure here consists in obtaining an average value for the number of bacteria taken up by phagocytic leucocytes in

a blood preparation, it has been questioned whether this can really be obtained by taking toll of only a fraction of the total number of phagocytes present. Various attempts have been made to apply mathematical principles to the solution of the question, but it must be held that at present no sufficient data have been available for a mathematical investigation, so that this aspect of the question is still *sub judice*. Granted, however, that the technique is reliable, there remain difficulties regarding the interpretation of variations in the opsonic content of sera, for constant changes in the amount present are possible. This may arise from variations from day to day in the amount of response in the body originated by the absorption of varying amounts of bacterial protoplasm from a focus of infection. The opsonic method is certainly the only serological method at present available for following the course of an immunisation, but the laborious nature of the procedure involved and the impossibility of an opsonist maintaining his training without daily practice contribute to make its use at present impracticable. In difficult vaccination procedures it lies with the clinician to define with the most laborious care the signs and symptoms of successful and unsuccessful reactions in the case of each infection.

We may now proceed to take up the practical results which have been obtained in the application of vaccination methods. First of all we may look at the use of vaccines as prophylactic . The three diseases in which the vaccination has been used prophylactically are typhoid fever, cholera, and plague.

The cure of typhoid fever is of especial historic interest as it formed the starting-point of Wright's great work. The vaccine here consists of a bouillon culture killed by heat made by the growth of a typhoid bacillus of definite virulence. The method is to inject 500 million and to follow this up 10 days later by a dose of 1000 million. Usually very little inconvenience follows the injection, there being some pain and stiffness at the site of inoculation, with, it may be, some tenderness of adjacent lymphatic glands and slight pyrexia, all passing off within a few hours. A large statistical basis relating to the efficiency of the treatment is in existence. In 40,600 cases observed, mainly during the South African War, 8600 were inoculated, and of these 2.25 per cent. subsequently contracted the disease, with case mortality of 12 per cent. Of the 41,000 uninoculated 5.75 subsequently contracted the disease, with a case mortality of 21 per cent. More recent statistics in the British Army[1] give even more favourable results,

the case incidence being .7 per cent. and the case mortality 4 per cent., and similar results have been obtained in the German Army, in which the treatment has beem adopted. There can be little doubt that all persons going to India or to any other region where typhoid fever is rife ought to be subjected to the treatment. Similar facts have been obtained with regard to cholera and plague.

In trying to estimate the results which have been attained by vaccine therapy in actual infections there are serious difficulties. In by far the greater number of diseases in which the treatment has been applied we have to deal with a chronic condition which under natural conditions may manifest alternations of improvement and exacerbation, and which may terminate in cure even when untreated. When, as *e.g.* in tuberculosis, the disease is dangerous to life, it is necessary to apply simultaneously every therapeutic measure possible, and the estimation of the part played by each in any improvement is impossible. The only practical test which can be applied is the observation of clinical improvement or deterioration. Thus ultimately judgment must consciously or unconsciously turn on a statistical inquiry in which a series of cases treated by this method is compared with a series untreated. In certain diseases some data for a comparison exist, but manifestly such series must be of great extent in order that disturbing factors may be submerged, *e.g.* on the one hand the part played by unusual susceptibility or resistance in the patient, and on the other that due to the too sanguine or too sceptical habit of mind of the observer. It cannot be too strongly insisted that opinions based on experience of a few cases, such as literature abounds in at present, is largely valueless. There are only two sets of circumstances which sometimes warrant an opinion being given on a limited experience. These arise when a sudden improvement tales place as the result of vaccination either in a chronic disease which has resisted all previous treatment or in an acute illness of fatal import. An example of the latter is found in cases of puerperal septicæmia reported by Hale White. Even here great caution is necessary in drawing conclusions. The present position of the whole subject may be said to be that there is almost no disease of bacterial origin, whether acute or chronic, in which vaccine methods have not been employed. With regard to many of these experience has been so limited that no statements as to the results obtained are available. In what follows reference is

made to several conditions which on the one hand furnish examples of what has been attained and on the other illustrate the difficulties which are encountered.

Chronic Skin Conditions.—First of all here we have the group which includes boils, small or large, single or multiple, in which there is little doubt that the pyogenic staphylococci play an important etiological part. As is well known, these are often characterised by the constant recurrence of suppurative lesions extending over months, or it may be years. The vaccines employed in the first instance are usually the stock preparations which are in the market, and which are made by mixing various strains of organisms isolated from skin suppurations. Where these are inefficacious it is advisable to have a special vaccine prepared from the organism isolated from the patient's own lesion. With regard to dosage it is laid down by Wright [1] that where the patient is developing an isolated furuncle, arrest of the condition will usually result from the injection of 100 million staphylococci, to be followed up four days later by a dose of from 250 to 300 millions. In chronic cases the initial doses ought to be the same, but as the treatment progresses with favourable results the amount may be gradually raised to 500 million, the inoculation being given with from 3 to 7 days' interval. The lesions being essentially superficial, the effects of the treatment can be judged of by whether or not an improvement or exacerbation of the symptoms follows any particular dose. The treatment has been widely applied, and Stoner [3] has collected the results of 140 cases observed by 33 workers. Of these 125 are reported to have been cured, 12 improved, and 3 not benefited. The latest reports of Wright's [1] own cases give a record of 104, of which 73 were cured, 29 were better, and 2 were unchanged or worse. Needless to say it is often necessary to apply the treatment for many months before a permanent change in the condition is effected. Besides furunculosis, the special skin suppuration known as sycosis has been successfully treated along similar lines.

It is necessary to differentiate acne from these ordinary skin suppurations, as the pathology of this condition is still obscure, and the part played by organisms of the ordinary pyogenic type is almost certainly secondary. A special bacillus, the acne bacillus, has been isolated alone—according to one observer from about half of the cases of the disease, and in the other half it has been found associated with staphylococci. The part played by this

organism is as yet undetermined, but the success of vaccine treatment has not been so marked as with the furuncular group. In a series of 133 cases [3] treated by staphylococcal vaccines 70 (53 per cent.) have been cured, 46 improved, and 9 not benefited. Mixed vaccines have been used by Fleming [4] in which, to an ordinary staphylococcal vaccine, in the doses given above, acne bacilli in numbers from 4 to 10 millions have been added. There is, however, no apparent improvement in the results. In 68 cases treated in St Mary's Hospital [5] 12 were cured, 42 improved, 12 unchanged, and 2 are reported worse.

Gonorrhœal Vulvo-Vaginitis in Children.—A careful series of observations has been reported by Hamilton [6] in which a certain number of cases was treated by small doses of vaccines and others by irrigation and ordinary methods. The test of recovery was that no gonococci were found in the vulva after six examinations extending over two months. Of the vaccinated cases 90 per cent. recovered, of the unvaccinated 70 per cent.; of the cured cases the average period necessary for the vaccine treatment to be effective was 1.7 months, and for the ordinary treatment 10.1 months. In acute gonorrhœa the results of the use of vaccines have not been striking, and it is difficult to understand success in treating a chronic gonococcal infection when the passage out of fluids from the lymphatics must be more scanty.

In *Tuberculosis* we have to deal with the most important and, unfortunately, also the most difficult branch of the subject. First we may look at the substances used in vaccine therapy here. The question largely turns on the views held as to the essential toxic elements of the tubercle bacillus. The tuberculins most commonly in use, namely, the Tuberculin R. and the Bacillary Emulsion, are, as has been stated, composed of the ground-up bodies of tubercle bacilli. Manifestly these preparations only contain the pathogenic elements actually present within the bacilli, and there is a divergence of view as to whether the toxic agents are present in the form or in the concentration most effective for producing an immunisation response. A variety of other modifications have from time to time, therefore, been introduced. Thus Landmann has a preparation which contains extracts made at different temperatures from bacilli freed of their fats; Denys uses a filtered bouillon culture of the bacillus; Béranek employs a growth of the bacilli in a special bouillon, and to the filtered culture adds bacilli dissolved in orthophosphoric acid. He holds that grinding does

not effect a true solution of the protoplasm such as is obtained by the use of the acid. Again, on the one hand bacilli freed from tubercle fats have been used, and on the other the fats themselves have been utilised. These facts are cited chiefly to emphasise the position that there is no agreement as to whether the best means of stimulating antibody production has been attained. This is not surprising if what has been said at the outset is borne in mind, namely, that we are totally ignorant of the essential processes underlying the pathogenic effects of the infective bacteria, but given a satisfactory means of stimulating an antituberculin mechanism in the body there are further difficulties. If, as is probable, recovery depends on antibodies reaching the invading bacteria, we must recognise that frequently in tuberculous lesions such an access to the bacilli by the body fluids is difficult or impossible. This will occur whenever bacilli are interned in a caseous focus, in which position they are largely outwith any lymphatic circulation. Thus it must be chiefly in very early lesions or in tubercular ulcers surrounded by little granulomatous deposit that vaccine treatment should meet with conditions favourable to success.

Again, in estimating the therapeutic effects of such treatment there are the facts that such a serious disease must be simultaneously attacked through every avenue open, and that without vaccines ordinary treatment is often eminently successful. Subsidiary to the last, there is the consideration that few records are available which enable us to judge of the number of cures following on ordinary treatment.

To take up the available data with regard to phthisis, Bandelier [7] in his sanatorium service reports 383 patients with two lobes affected treated with tuberculin, and compares the results with 299 cases in the same stage treated by sanatorium methods. None of the latter were reported cured, while in 15 of the treated cases this favourable result was obtained. It is further to be noted that while in 25 per cent. of the untreated cases the patients were so far recovered as to be fit for work, 75 per cent. of those treated by tuberculin were in this condition. Ritter [8] compares results obtained in his sanatorium without tuberculin during the years 1899-1903 with those obtained in 1903-1907 with tuberculin. Of 193 patients whose treatment extended over a year, from 50 to 90 per cent. of tuberculous cases were at the end of the time fit for work, as compared with from 22 to 72 per cent. of those untreated.

While no similar data exist with regard to British or American sanatorium treatment, the results have apparently not been so striking, although the opinion is generally expressed that in treated cases relapses are not so likely to occur, and febrile cases are less apt to go on to a pyrexial stage. In Britain such observers as Philip, Latham, and Lawson are agreed that early cases show distinct benefit when treatment with tuberculin is added to ordinary methods.

A very important aspect of the treatment is in cases where mixed infections are being dealt with, and it seems to be the general opinion that when pyogenic cocci are present in the lung the use of a vaccine made from these organisms alone or combined during alternate periods with treatment by tuberculin frequently results in reducing these cases to a more quiescent stage.

The outstanding feature of the modern treatment is the smallness of the initial doses used. Although considerable variations in practice obtain, the general tendency is to the use of very small doses, frequently not more than a hundred-thousandth of a milligram of bacillary emulsion, and the maximum reached frequently not exceeding a ten-thousandth. In very few cases is the initial dose used more than one-thousandth of a milligram.

In by far the greater majority of cases the course of the treatment has been guided by clinical observation alone. It is manifest that this must be constant and close, and that any advanced reaction indicated by rise of temperature, increase of expectoration, or increase of lassitude on the part of the patient is to be avoided ; that the best results are obtained in cases where the disease is limited to one lobe ; and that the treatment of febrile cases is only to be undertaken by those with extended experience.

Tubercular Glands.—The characteristic of this lesion is the fact that for a long period the bacilli are closed up in the gland through the occurrence of caseation. If it were possible to obtain such cases before caseation had occurred the condition might be amenable to vaccine treatment, and where this condition has been fulfilled success has attended the treatment. Caseation, however, may be such an early event that ordinary surgical procedure must usually be necessitated. It is a question, however, whether a certain number of recurrences of tubercular mischief might not be prevented by a post-operative course of vaccine treatment, and success has attended the procedure where recurrences have occurred or where the absence of early surgical interference has

resulted in sinus formation ; especially in these last cases a mixed infection is not infrequent, and here benefit has resulted from the use of a combined vaccine.

Tuberculosis of Bones and Joints.—The results recorded here are meagre, and little can be said regarding them. There is one point relating to synovial tuberculosis to which reference may be made. Caseation with the accompanying danger of interning the tubercle bacilli is frequently a much later event than in tuberculosis of lymphatic glands, a very great thickening of synovial membrane being possible with a minimum of caseation. In such circumstances the tubercle bacilli are probably more accessible to the antibacterial capacities of the body fluids. This may be a factor in the success which frequently attends the immobilisation of a tuberculous joint, and a plea might be put forward for the application of vaccine therapy during periods when rest is the main treatment used.

Lupus.—In 21 cases of this disease, collected by Carmalt Jones [5] at St Mary's Hospital, 3 were cured, 17 were improved, and 1 was unchanged, and it must be left to the future to determine whether vaccine therapy manifests advantage over ordinary methods of treatment.

To sum up, with regard to tuberculosis, there is considerable evidence that early cases before caseation has occurred tend to yield under vaccine therapy to a greater degree than to ordinary treatment.

Further, where tubercular ulceration occurs under such circumstances that the body fluids can readily pass through the zone of bacterial invasion (this being the condition in many cases of phthisis) good results are obtained, but where bacilli are locked up by caseation vaccine therapy will probably have little effect. The vaccine treatment has been applied with striking success in old-standing, semi-quiescent tuberculosis, especially where complete removal of the focus by ordinary methods is impracticable, and certain apparently desperate cases of this kind, for example, disorganising tuberculosis of joints, have yielded in a surprising fashion.

Non-Tubercular Infections of Urinary Tract.—These may be caused by a variety of organisms, and every case must be investigated by the bacteriological examination of urine obtained with all aseptic precautions. When the organism probably causing the condition is isolated an autogenous vaccine must be prepared and

carefully applied in small initial doses of from 20 to 30 million bacteria. The results obtained are often very striking, especially in cases which have not had a very long duration, and even in long-standing cases which have resisted ordinary treatment the symptoms have yielded in a short time. It is to be noted, however, as a very general experience, that even after the symptoms have disappeared a bacilluria may still persist. Infections of the urinary tract wall illustrate the difficulty that even the observer with the widest experience has as yet insufficient ground for maintaining any other attitude than one of reserve.

The most acute diseases have been attacked by the vaccine methods, and two examples of the results obtained may be mentioned.

Pneumonia.—A number of observations have been made in this disease. Willcox and Morgan [9] treated 43 cases with doses of from 20 to 30 million pneumococci, the dose being repeated every 24 to 48 hours if necessary. The treatment may be commenced with a stock vaccine until the autogenous vaccine, which apparently gives better results, can be prepared. One striking result observed was the early occurrence of a crisis, this coming on in 6 cases from the 2nd to the 5th day. Another point was that in a third of the cases the fever fell by lysis. Of the 43 cases only one died.

Leary [10] has used the treatment in 83 case spread over three years, the dosage being similar to that already given. The effect was a moderation in the clinical symptoms, and the death-rate was 9.7 per cent. In 16 cases treated by Egbert and O'Neill,[11] 8 of which were double pneumonias, similar results are recorded, only 1 of the 16 being fatal. Out of 155 cases collected by Stoner [3] 135 recovered, and as Musser and Norris [12] state that the average mortality in pneumonia is about 21 per cent., there is considearble ground for advocating further observations being made in this disease.

Typhoid Fever.—The vaccine method has been applied in the treatment of this disease. Leishman [13] and Smallman [2] recommended the administration of 100 million bacilli, that is, one-third of the first dose given in prophylactic work in typhoid fever. If the temperature showed a tendency to fall the dose could be repeated every four days. According to Leishman's latest report [13] encouraging results have been obtained. A series of 30 cases were treated by Waters and Eaton [14] along similar lines, 25 to 50 million

bacteria being used. From an inspection of the charts it is evident that the fall of the temperature did not take place much earlier than in ordinary cases, and that thus little effect was produced. Richardson's [15] results were similar, but, comparing treated with untreated cases, he came to the conclusion that in the former relapse was less frequent. The relative part of success met with by the last observer may be due to the small doses used. The vaccine treatment has been applied with a view to the cure of typhoid "carriers," but although one or two cases are stated to have given a good result, usually no effect has been produced.

Erysipelas.—A noteworthy series of observations was made in this disease by Ross and Johnston.[16] Although the numbers are not large, the value of the work is the comparison of 19 cases treated by ordinary methods with the succeeding 19 treated by vaccination. In the former the average duration of the illness was 25 days, and in the latter 12.8 days. The average stay in hospital in the non-treated cases was 18 days, and in the vaccinated 11.2. There was thus evidence that the duration of illness was lessened by the treatment, and that this had effect was also shown by the fact that in 6 of the untreated cases complications occurred in comparison to 1 such event in the vaccinated cases.

With regard to *dosage*, in ordinary cases the initial dose was 20 millions, followed by 10 millions, on the succeeding day. In severe cases the initial dose was 10 millions, succeeded by 5 millions on the second day. The treatment was maintained by inoculations on alternate days till the temperature was normal.

From what has been said it will be gathered that the application of vaccine therapy is limited by three chief factors :—*First*, the limitation of the capacity for antibacterial response in the human body ; *second*, the evidence of individual peculiarities of disease manifestations ; and *third*, by the fact that we are still in the dark as to the means to be adopted for bringing out an antibacterial response in its highest degree.

With regard to the conditions favourable to the action of vaccines, what has been said regarding tuberculosis applies very generally. The essential point is that the body fluids containing antibacterial substances must have free access to the focus of infection. The non-existence of this condition explains much of the want of success which has attended the treatment. In tuberculosis we have the interning of the bacilli, and in many conditions we have the bacilli multiplying on free surfaces of the body or in

such situations as are really inaccessible to the body fluids. In cases of coli infection of the bladder this probably explains the bacilluria persisting after symptoms have disappeared, and it also explains the failure of vaccine therapy to affect an acute gonorrhœa or the multiplication of the typhoid bacilli in "carrier" cases. It is to be noted that in many cases the access of antibodies to the bacteria can be favoured by associated procedures, familiar examples of which are the opening of an abscess, laparotomy in tuberculous peritonitis, massage, and in certain cases probably the diminution in the coagulability of the blood by the exhibition of organic acids, as has been recommended by Wright.

A serious difficulty, however, is that in vaccine therapy practice is in advance of scientific knowledge. Whilst the application of vaccines has followed from the facts ascertained regarding immunisation responses in animals, we are hampered by our want of knowledge regarding the substances in the bacterial protoplasm which stimulate reactive mechanism in the body. The success, however, which has attended the treatment of such conditions as furunculosis, regarding which all are agreed, is such as to suggest that when further knowledge regarding the pathology of infection is attained a similar success may attend the treatment of other diseases.

We may sum up by stating that a case has been made out for further observation. The present situation is not final, but if advance is to be made certain conditions must be fulfilled. The most important of these is that every vaccine procedure must be looked upon as of the nature of a scientific experiment, often of a prolonged and tedious character, and unless this be clearly recognised the new therapeutic procedures can never have a fair trial. The fulfilment of this condition necessitates on the part of anyone applying the method a mastery of the elementary underlying principles, the most essential of which is that no hard and fast rule of dosage can be laid down as applicable to cases presenting a clinical similarity.

It may be laid down as a general principle that in ordinary acute infections the initial dose ought to be limited to a few millions, while in true chronic cases 50 or 100 millions may be used, but the essential point is that the effect of every single dose must be carefully watched. The mere fact that so often it is necessary to employ a vaccine made from the actual strain of bacilli responsible for the individual infection being treated accentuates

the necessity for every vaccination being considered by itself. A similar principle is true of the interspacing of the doses. The best interspace must be determined for every case. Vaccine therapy more than any therapeutic method recently introduced has suffered from the indiscriminate use of its weapons by those who have taken no trouble to acquire a knowledge of their character.

A serious difficulty of the situation is the fact that so few possess as yet an extended experience such as may guide them in undertaking vaccine work, and while the development of further specialisation in medicine is to be regretted, it may be laid down as a general principle that in all serious cases where vaccination is applied special knowledge is necessary if the best interests of the patient are consulted.

There is one further remark I would make in concluding. There has been a tendency in certain quarters to apply vaccine treatment to disease whether or not there is any scientific ground for supposing that the condition present is of bacterial origin. Apparent success following the administration of a few doses of a vaccine prepared from a supposed causal organism has even been taken as evidence that the organism really has a constant connection with the disease. If what has been said regarding the difficulty under many circumstances of attributing clinical improvement to the use of a vaccine has been appreciated the crass empiricism of such a procedure will be evident. Action of this kind will discredit not so much vaccine therapy as the whole practice of medicine.

REFERENCES.—[1] Wright, *Studies in Immunisation*, London, 1909. [2] Smallman, *Journ. R. A. M. C.*, 1909, vol. vii. p. 136. [3] Stoner, *Amer. Journ. Med. Sci.*, vol. cxli. p. 186. [4] Fleming, *Lancet*, 10th April, 1910. [5] Jones, *Introduction to Therapeutic Inoculation*, London, 1911. [6] Hamilton, *Journ. Amer. Med. Assoc.*, 1910, vol. liv. p. 1196, and *Journ. Infect. Diseases*, 1908, vol. v. p. 158. [7] Bandelier, *Beitr. z. Klin. der Tuberkulose*, 1910, vol. xv. p. 1. [8] Ritter, *Deut. med. Wochenschr.*, 1908, p. 1259. [9] Willcox and Morgan, *Proc. Roy. Soc. Med.* 1909-10, vol. iii. pt. i. [10] Leary, *Bost. Med. and Surg. Journ.*, vol. clxi. p. 186. [11] Egbert and O'Neill, *New York Med. Record*, 1911, p. 970. [12] Musser and Norris, *Osler's Modern Medicine*, vol. ii. p. 537. [13] Leishman, *Journ. Roy. Inst. Pub. Health*, 1910, vol. viii. pp. 385, 513. [14] Waters and Eaton, *New York Med. Record*, 1909, p. 93. [15] Richardson, *Journ. Amer. Med. Assoc.*, 1910, p. 255. [16] Ross and Johnson, *Journ. Amer. Med Assoc.*, 1909, vol. lii.

Meeting III.—December 20, 1911

Mr J. M. COTTERILL, *President, in the Chair*

This was a clinical meeting held in the Royal Infirmary.

I. EXHIBITION OF PATIENTS

1. *Dr Dawson Turner* showed—

(*a*) Male, aged 50, with LEUKOPLAKIA. Disease began a year ago by the appearance of a white spot, which, despite treatment, increased until it was 1 inch long by ¾ broad. 60 mgh. exposures to radium have been successful in removing the disease from the parts treated.

(*b*) A male, aged 1¾ years, with CONGENITAL NÆVUS. On admission one year ago, the nævus measured 1½ cm. in diameter and was considerably raised above the surface (see photograph). 37½ mgh. exposures to radium have caused its disappearance.

2. *Dr John Eason* showed—

Case of GOUT in a man aged 70, a railway porter, who has been a heavy beer-drinker. His father was an Englishman and by occupation a butler. He exhibits numerous gouty deposits of varying size; the largest, situated over the right olecranon, is the size of a golf ball. Clinical examination of the deposits shows that they are chiefly composed of sodium biurate and organic matter.

3. *Mr D. P. D. Wilkie* showed—

(*a*) Woman, æt. 58, nine months after Salvarsan treatment for pronounced TERTIARY SPECIFIC LESIONS. Contracted syphilis 25 years ago; treated in the lock wards of the Infirmary for several months for severe secondary lesions, and continued mercurial treatment till present year. For 15 years had regularly attended the out-patient department of Leith Hospital for syphilic psoriasis and leukoplakia. Given .5 grm. Salvarsan intravenously in March 1911. Psoriasis, present for 15 years, disappeared in 15 days.

(*b*) Woman who had had a SPECIFIC ULCER on leg for 6 years, in spite of local and general treatment, and had given birth to four still-born children. Given .5 grm. Salvarsan intravenously in March 1911. Ulcer healed within 4 weeks. In October 1911 gave birth to a healthy child.

4. *Dr Chalmers Watson* showed—

Early RHEUMATOID ARTHRITIS illustrating apparent complete recovery under treatment directed to gastro-intestinal conditions.

Man, æt. 23, with painful swelling of phalangeal, metacarpo-phalangeal joints, ankles, wrist, and elbow; onset in April 1911. Typical picture of rheumatoid arthritis of the afebrile type. Bacteriological examination of urine negative. Recovery under regulation of diet and daily administration of saline aperient.

5. *Mr Francis M. Caird* showed—

(*a*) Male, aged 27. Suffered from dysentery when in the East. Admitted suffering from tropical abscess of liver and empyema. Incision and drainage. Condition not greatly relieved until after treatment with large doses of ipecacuanha, after which discharge rapidly subsided.

(*b*) Female, aged 32. Extroversion of bladder plus epithelioma. Removal of neoplasm, entailing division and removal of part of right ureter. Subsequent ascending pyelitis of right kidney.

6. *Dr Byrom Bramwell* showed (by *Dr Edwin Bramwell*)—

(*a*) HYSTERICAL CONTRACTURE OF HIP.

Female, aged 21, single, admitted to E. R. I. on November 10th, 1911, suffering from very marked scoliosis and apparent shortening of the left leg, thought by Dr Garnett Wright and Dr Edwin Bramwell to be due to hysterical contracture, but diagnosed by some other observers as due to disease of the hip-joint. The condition dated from a fall down a flight of stairs two years previously. After the accident the patient worked with difficulty for some weeks; she was then admitted to hospital, and discharged improved at the end of five weeks. She continued to suffer from pain and deformity. In March 1910, was admitted to another hospital, where she remained for five weeks; she states that she was told she had disease of the hip-joint and was ordered a thick-soled boot to correct the deformity. She had been under medical advice since, complaining of pain in the back and hip and marked shortening and deformity of the leg. On admission to E. R. I. extreme lateral curvature and tilting of the pelvis upwards and to the left; great apparent shortening of left leg. X-ray examination showed no disease of either hip-joint. December 7th, patient examined under chloroform; the deformity completely disappeared under the anæsthetic. Patient was then treated

by isolation and suggestion. Rapid improvement has since taken place.

(*b*) TABES : Gastric Crises treated by Section of Posterior Nerve Roots.—The case described by Dr Byrom Bramwell and Mr Alexis Thomson at the November meeting of the Society.

7. *Mr C. W. Cathcart* showed—

Patients illustrating satisfactory functional results obtained after fracture, although the restoration of the contour of the bones is not perfect.

8. *Mr George Chiene* showed—

A girl, aged 7 years, 4 months, after operation for OBLIQUE FRACTURE OF THE SHAFT OF THE FEMUR.

The patient, when playing with a walking-stick, tripped and fell ; was admitted to hospital the same day suffering from a fracture of the shaft of the left femur. The fracture was reduced under $C.H.Cl_3$ by the resident surgeon, local splints applied, and extension, at right angles, to the long axis to the body, by means of a crossbar over the crib. The patient was somewhat restless during the treatment, and a fortnight later the limb was put in a horizontal position instead of the vertical. Marked shortening had occurred, and therefore, three weeks after admission, the femur was cut down upon through an external incision, the fragments separated, adjusted, and wired. Ten days later the skin stiches were removed, and three weeks after the operation the patient was allowed up, being dismissed a week later.

X-ray photographs taken before and after operation were exhibited, the latter showing that the restoration of the fragments was as perfect as the functional results. The patient was shown, as operations for fracture of the femur in children are comparatively rare, satisfactory results usually being obtained by the non-operative methods.

9. *Mr Henry Wade* showed—

(*a*) NEPHRECTOMY FOR ACUTE CONSECUTIVE SUPPURATIVE NEPHRITIS.

Mrs C., aged 40, operated July 12th 1911. On admission, temperature 102.5°, pulse 120. Abdominal rigidity and intense local tenderness in right iliac region. Right kidney palpable. History of previous urinary trouble, frequency of micturition, etc.

Suppurative nephritis diagnosed. Right kidney excised (transperitoneal route).

(*b*) Cellulitis of leg due to anthracoid organism.

W. R., aged 19, admitted November 11th, with acute celulitis of leg. Inflamed area incised. Tissues necrotic, no free fluid pus, improvement slight. Inflammatory focus on thigh incised four days later; similar appearance seen and similar result. Pathological examination; anthrax bacilli. Treated Sclavo's serum—rapid improvement.

10. *Mr Miles* showed (by *Dr Lochhead*)—

(*a*) Patient illustrating result of plastic operation to cover end of stump left after amputation of fingers for crush. Granulating surface covered by flap taken from anterior abdominal wall.

(*b*) Patient illustrating a stage in the restoration of the nose and upper lip after syphilitic ulceration. To support flap to be taken from forehead a bony septum was formed by implanting a slice of bone obtained from the astragalus of another patient on whom arthrodesis of the ankle was performed.

Meeting IV.—January 17, 1912

Mr J. M. Cotterill, *President, in the Chair*

I. Election of Members

John Fraser, M.B., Ch.B., F.R.C.S.Ed., Blackie House, Edinburgh; A. Fergus Hewat, M.B., Ch.B., M.R.C.P.Ed., 13 Eton Terrace, Edinburgh, and Thomas James Thomson, M.D., 3 Greenhill Park, Edinburgh, were elected Ordinary Members of the Society.

II. Original Communications

1. Adjourned Discussion on Vaccine Therapy. Introduced by Dr James Ritchie, Secundus, at the November Meeting of the Society (see p. 28).

Dr G. Lovell Gulland said he should like, in the first place, to congratulate Dr Ritchie on the very able exposition of the subject which he gave, and which has since appeared in the *Edinburgh Medical Journal*. He had said a great deal of what one would have said as regards the necessity for caution; he laid great stress on

the importance of the estimation for results; and, further, pointed out that a small series of results was of comparatively little value. He (Dr Gulland) fancied the only way at which anything like an opinion could be got was by all the individual small results being put together and analysed.

As regards *tuberculin*, he (Dr Gulland) had only had to deal with glands, lungs, and certain kidney and other cases. In *gland tubercle* his impression was that the injection of tuberculin gives very satisfactory results indeed if certain elementary precautions are observed. The glands injected should not be amenable to operation; there was no use treating large masses of glands which must be removed. Where there was breaking-down or evidence of acute mischief the condition should be treated in other ways or by the surgeon; in such cases the patient would certainly not do well. In large glands, especially about the neck, where there is not a great deal of periadenitis, he had found tuberculin extremely useful; great improvement in weight and in the whole condition of the patient had occurred, and the glands had dried up completely. In the early part of the treatment the important point is to begin with a small dose; he never went sufficiently far to get the slightest reaction, and he went on as long as possible. Dr Ritchie emphasised the point of the tuberculin reaching the focus which was affected. He (Dr Gulland) was convinced that tuberculin acts also in other ways. With regard to bone tubercle, he frequently had to deal with spinal cases.

In *pulmonary cases* there was little agreement as to what is the right thing to do. His practice was not to use tuberculin for cases which are obviously doing well—cases in hospital putting on weight, the lung lesion drying up, temperature normal, pulse slow, etc. Further, it was certainly unwise to use tuberculin in cases of acute tubercle. The cases in which it is most useful are "stuck" cases—cases in which there is a certain amount of improvement with open-air treatment and then nothing further; also in the very chronic cases, which are chiefly fibroid, most surprising results are obtained. Sometimes successes were seen in bad cases too. He referred to one of his earliest cases, at the time of the revival of this question, where the patient was going steadily downhill. With great difficulty the friends were persuaded to allow tuberculin injections. There was a great deal of moisture, the heart and digestion were bad, but from the time of injection the patient began to improve, got well, and has kept well.

In *kidney and bladder cases* his experience was that tuberculin was useful.

The question of the particular tuberculin used was important. Personally he had steadily used T.R., partly because he began by using it, and partly because he had succeeded in getting good results from it. He was not prepared to say that it was ideal, or that it gave better results than other forms. He did not think it mattered which form was used—the important thing was that one should use one preparation and stick to it until one knows it thoroughly. He had seen men jumping about from one form to another, and he was perfectly certain that they did not get the same confidence in dealing with it. He began with a very small dose, but, of course, the dosage must be varied with the kind of case and the acuteness of it. He endeavoured never to produce a temperature reaction, and very rarely indeed gave above $\frac{1}{10000}$ mgrm. of T.R. In children, particularly young children, it was necessary to be exceedingly wary; in children it seemed to be a much more active drug than in adults, and the dosage had to be regulated by the age of the patient.

A great deal had been written of late on the question of giving tuberculin by the mouth, and the utility of using it in that way. It was, of course, not ideal in cases where it can be given by the needle, but it was useful in the case of nervous children and also adults who would not submit to the needle. Provided it is given on an empty stomach in the morning, as far away from food as possible, he was quite convinced he had got good results from it.

It so happened that he saw a good many cases of *puerperal septicæmia*, partly because they happened to be anæmic cases as well, and in these cases his experience of vaccines had been most disappointing; better results were obtained by antistreptococcus serum. In some of the cases where vaccines were used they produced definite harm. In acute cases it is rarely possible to use vaccines. In other septicæmias his experience had been that the vaccine treatment was not very satisfactory. The difficulty was that these cases were very seldom got in an early stage; they are sent to hospital after having been ill for ten days or longer, and even in consultation they are only seen after a time, consequently a new growth was very seldom got from the blood at all. If one does succeed, the changes in the patient have often gone too far to allow one to do much good. If one succeeds in getting a blood culture during the first three days, in all probability much better

results are obtained. One hopes that the profession will be wakened up to the importance of dealing with septicæmias as early as possible.

In *gonorrhœal infections* he had seen very grave results indeed. He had seen cases of chronic gonorrhœa, going on for long periods, in which vaccine had been tried with the most disappointing results; the stimulation seemed just to waken up the gonorrhœal condition, but his experience of gonorrhœa in that way was, of course, limited. In gonorrhœal joint affections he found vaccine treatment very useful, provided one is careful to begin with a small enough dose and go on long enough.

In *coli infections of the urinary tract*, as they occur in adults, and especially in women, one must differentiate several forms in their relation to vaccine treatment. In acute cases it is never necessary or wise to attempt it. They almost all get better with ordinary treatment, and generally no bacteriuria is left. In chronic cases there are three main varieties—(1) Pure bacteriuria without symptoms. In these vaccine treatment is usually disappointing, probably because the organisms are on a surface where the antibodies cannot reach them. (2) Bacteriuria associated with ulcer in the bladder or urethra, or with inflammatory conditions in the pelvis. In these cases the ulcer or pelvic condition must first be treated. Thereafter he had obtained good results with vaccines, but it was, of course, quite possible that these were more apparent than real. Possibly other treatment might have done just as well. (3) Cases where there was constant or more often repeated infection of the urinary tract through the kidney from the bowel. In these cases vaccines are of no use. The bowel must be treated. He had found it very easy to produce febrile reaction with even small doses of coli, and recommended great caution.

He had been much encouraged by the results of vaccine treatment in some *respiratory conditions*. Nasal catarrhs sometimes do well, sometimes badly, and it seems to make little difference whether one uses stock or autogenous vaccines in this respect. Probably the cases which did badly had definite structural changes present which kept up the catarrh. The same statement applied to asthma. Much better results can be got in chronic bronchitis, bronchiectasis, and chronic non-tubercular abscess of the lung. Acute abscesses either die or get better, as a rule, and only need vaccine treatment if they are drifting into chronicity. His results had been best when the pneumococcus was the organism concerned.

With mixed vaccines there was the usual difficulty of dosage and of estimation of relative virulence. The results were better in the slighter and more recent cases and in young people. Too much must not be expected where there are definite and widespread structural changes in the lungs and secondary cardiac derangement, but even in these fair results can sometimes be obtained.

Dr T. Shennan joined with Dr Gulland in congratulating Dr Ritchie upon the very clear exposition of the subject which he had given. He did not wish to criticise, but to ask one or two questions. It might be useful if Dr Ritchie were to amplify his description of the focal character of lesions. He made a great deal of that, and rightly, but he (Dr Shennan) should like him to give his experience or advice in such cases as streptococcal conditions in which there are multiple foci, *e.g.* endocarditis with multiple secondary abscesses. He himself had always felt inclined to discourage the giving of vaccines in such cases. He had seen as a result the temperature go down and remain low, but it was just a question whether this might not be evidence of severe toxæmia rather than of improvement.

Dr Ritchie had referred also very rightly to the mode of action of vaccines, but he (Dr Shennan) should have liked if he had said more about their toxicity, because they were not dealing with a simple therapeutic agent, but with a therapeutic agent of the nature of a very active bacterial protein; it was not a case of homœopathic treatment, but of treatment by extremely small doses of a very toxic agent which produces a reaction in the tissues. The importance of this had been borne in upon him recently by a friend in doing a vaccination. He (Dr Shennan) asked him what dose he was giving, and he replied, "The contents of the bottle," meaning the ampoule containing the vaccine, but he was unable to say what the dose was. One must be very careful to know the actual dose of the vaccine. There was no doubt that different vaccines varied in their toxicity. He had seen harm done by overdoses of *bacillus coli*. Streptococcal and pneumococcal vaccines also must be given in extremely small doses.

In connection with lupus he had not had much experience in giving vaccines in tuberculous conditions, but in one case of lupus he found no benefit at all by any dosage of T.R. He should like to know the experience of others in treating lupus cases with mixed vaccines. His colleagues and he turned out a large number of

vaccines in the course of a year, and they had met a great number of cases in which the *bacillus proteus* had been present, *e.g.* from cellulitis, sinuses, fæces, appendicitis, middle-ear disease, lateral sinus, suppuration, lumbar puncture fluid, empyema. The question was, Is it a pathogenic organism or has it anything to do with the effect of the other organisms present in assisting their action? He was rather against mixed vaccines as a whole, but when giving them they had been going on the principle of separating the different organisms present and standardising each.

One or two points with regard to results. With the *micrococcus catarrhalis* he had found most encouraging results in ordinary common colds, particularly when it is associated with *pneumococcus*. A vaccine often clears away the active condition and actually protects the individual from other attacks. He had not much experience of treatment with the *gonococcus*, but with the *staphylococcus* he had, of course, a fair amount of experience. 43 per cent. of the vaccines they sent out from the Pathological Department of the Infirmary were for staphylococcal cases. That would give some sort of idea of the ratio of such cases. In one staphylococcal case, where the patient, a male, aged 65, had had 200 boils and 8 carbuncles, injections were given; after several months' treatment they cleared away completely, and there had been no return for several years. On one occasion the dose was given too soon; a very severe attack of boils resulted, followed by the eighth carbuncle, which was the worst of all, but it was the last. This would emphasise the importance of watching the doses and the intervals between the doses.

The last point was by way of suggestion. He had sometimes met with very curious toxic conditions in which it was very difficult to say what was the actual cause. He mentioned one case, which had been not at all amenable to ordinary treatment, in which the patient nine years previously had had a very bad attack of boils which had brought down the general health very considerably—in fact, the patient had never completely recovered. The pus from the boils was examined, and the *staphylococcus aureus* found almost pure. The patient was very subject to colds and slight inflammatory conditions, and on such occasions almost invariably the *staphylococcus aureus* was found. After one or two experiences of separating this organism from different lesions he began to wonder whether the chronic toxic condition might not be due to a chronic "latent" infection by the same organism. That idea was supported by the fact that the opsonic index was 0.65 to the

autogenous staphylococcus, and after one inoculation it rose to 0·85, and was still rising. Such cases, of course, had to be very carefully scrutinised and watched before vaccines are tried. He suggested that it would be well to keep one's eyes open for these cases.

Dr Struthers Stewart said that one or two points had occurred to him dealing entirely with the clinical aspect. Staphylococcal infections were very common; everybody saw a considerable number of such cases. He drew attention to the point that the vaccine treatment of acne should be continued until all the redness and inflammation round the foci disappeared. He had seen several cases where it had not been carried out long enough and the condition had relapsed. Streptococcal cases, in his experience, yielded better results than any others. He had seen almost immediate relief of pain follow inoculation. In one case in which a sinus followed tuberculous disease of the spine, which had been operated on, and where it had persisted for about a year, the condition was found to be streptococcal. After eight inoculations of vaccine the sinus healed up entirely; no other treatment was applied. Bronchitis seemed to be fairly often due to the streptococcus, and here, again, the results were satisfactory. After an inoculation the sputum increases in amount, and on physical examination the physical signs are somwhat increased. This condition continues for perhaps three or five days, and is then followed by gradual diminution in the amount of sputum. In such cases the amount of sputum is to be used as an indicator for reinoculation—a secondary increase after a week indicates reinoculation. In acute and severe tonsillitis, too, he had found the streptococcal vaccine useful. In one case where the temperature was 104° F. he gave a dose of 5 millions of the streptococcal vaccine. In the evening the patient was very comfortable—temperature 101° F.; in 24 hours it was normal and did not again rise. The patient was practically well the next day.

He could not agree with Dr Shennan about the pneumococcus; he has been less successful with it. In pneumonia he found it difficult to form a definite opinion. If the vaccine is given before the third day the crisis appears before or about the fifth day; if more than three days have elapsed before inoculation he was not satisfied that the vaccine was of any benefit. The doses of vaccine mentioned by Dr Ritchie—20 to 30 millions—seemed to

him too large; he (Dr Stewart) had never used an initial dose above 10 millions. With tonsillitis, when due to the pneumococcus, he had not been successful at all. In one case of acute suppuration of the mastoid he has got no result. In cystitis due to the bacillus coli results have been satisfactory, the first signs of improvement being diminution of the bladder irritability. In such cases it was almost essential to use an autogenous vaccine; the stock vaccines seemed to fail.

A great deal had been written about rheumatoid arthritis of late, and in some cases the results were satisfactory. He (Dr Stewart) had examined 22 cases of this kind recently, and in none had he found the diplococcus described by Bannatyne and Lindsay. He mentioned the case of a young girl with repeated bilious attacks accompanied by pains in the joints. The patient had been abroad, and tried various diets without any result. Examination of the urine during one attack showed a high specific gravity, the presence of urates, bile pigment, and indican. Immediately after an acute attack of biliousness the joints were distinctly better, and remained so from a fortnight to six weeks. The blood on opsonic examination was 0.3. She was given 10 millions of stock vaccine. This was followed by a typical bilious attack; after the attack had passed off she again felt better. She was told to come back and see Dr Stewart as soon as the headache and nausea began. She returned in 9 days, and was given another injection. This time the reaction was not nearly so severe, and the patient remained free from pains in the joints and headache for 20 days. The inoculations were continued, and after the 6th, movement in the painful joints began; now, after the 9th inoculation, she can use the hand so well that she can ride and manage a spirited horse. After the first 3 inoculations a saline purge was given to lessen the effect of the reaction.

As regards dosage the amounts given in books were too large. The doses he used were—staphylococcus, 50 to 1000 million; streptococcus, 1 to 50 million; bacillus coli, 2.50 to 100 million; pneumococcus, 5 to 50 million.

Where pus is enclosed which cannot be removed by operation he had never seen any result from vaccine.

Dr Stewart had found that if the dose of vaccine were efficient the inoculation was followed by a leucocytosis. If there were no leucocytosis either the dose was too small or the patient was incapable of reacting to the vaccine. If the latter, the prognosis was grave.

Mr Peel Ritchie thought the present state of inoculation treatment very interesting. He feared there might be a reaction in its use on account of the bad results from its indiscreet use or the unsatisfactory results from its incorrect use. It was most important to recognise its limitations and to understand exactly what is to be expected from it in order to avoid disappointment. With this proviso one might well look upon inoculation as a routine treatment in all infective conditions where the causal agent is known. There was a special satisfaction, in that the treatment is a specific one. On the other hand it was a great mistake to look upon it as a thing apart, contra-indicating other treatment, local, general, or operative, or to turn to it as a last resort. It was in no way antagonistic to other forms of treatment, and as for operative work, inoculation, when fully developed, would probably prove the greatest advance since the introduction of antiseptic methods, of which it was really a further development, in ensuring safety and certainty of results and of extending operative possibilities. He was specially referring to its use prophylactically. It was probably a mistake, therefore, to judge of its value by pitting statistics of the results of inoculation treatment alone against those of other forms of treatment alone. The best results would be obtained by using inoculation along with such other methods of treatment as might be required.

But there were many difficulties to contend with, and, first, with regard to the chaos of dosage. Every writer put forward his own scheme of dosage when based on an enumeration method. The enumeration of organisms was unsatisfactory, because one was estimating in numbers cocci or bacilli which vary enormously in diameter or length in different cultures. It was impossible to arrive at a satisfactory dosage in that way. A uniform standard was necessary, and that could be obtained, as was done with tuberculin, by weighing the solid mass of dried bacteria.

Then there was the uncertainty as to etiology. Bacteriology had advanced far, but not far enough, from the point of view of the inoculator, in giving information as to the exact causal agents. Take, for instance, appendicitis or affections of the mouth or nose. On any mucous tract there might be a great many organisms present, but it was very difficult, or impossible, to say what the actual causal infective agent might be when an infection had developed. Then there were also the many internal conditions where one could only surmise as to the bacterial causation. There

was a great field for work in these directions. There was still a lack of knowledge, too, as to certain constitutional conditions which seem to cause delay in immunisation, as one may see in gouty cases for instance, and as to such obscure influences on the state of immunity as change of environment may produce, as shown by the tendency of people going on a holiday or coming back from one to develop boils, colds in the head, or other infective conditions. The recent work also on supersensibility or anaphylaxis opened up very large questions, which might greatly alter the present views with regard to inoculation treatment.

Then there was the lack of satisfactory results where an infection was confined to a mucous membrane or some superficial area of skin, as one finds in catarrhal affections or in lupus. In this connection he would specially refer to gonorrhœa. As an acute infection of the urethra there was, unfortunately, but little benefit from inoculation, while gonorrhœal infections of the joints or other internal parts are benefited. This is probably not a special feature of the gonococcus, but due to the difference of results in treating a superficial or on the other hand an internal infection.

Individual cases, again, present difficulties on account of some special local feature of anatomical or mechanical nature, and in that respect he would mention foreign bodies in the widest sense, such as necrosed bone, calculi, effusions in joints, caseous material in tuberculous affections, buried ligatures of silk, etc. These all constituted foreign bodies which, so long as persent, prevented healing, and it was not to be expected that inoculation itself would bring about their disappearance. Abscess cavities not amenable to drainage, or with excessive induration of their walls, hindering the surfaces coming together, might be absolutely prevented from healing, even though one might at the same time by inoculation get rid of a number of the organisms and diminish the discharge.

With regard to a point in Dr Ritchie's paper he must disagree with his statement that in the formation of antibodies "very little change can be observed in the body for from 36 to 48 hours." In a paper which he (Mr Peel Ritchie) had read before the Society some time ago he drew attention to the early effects of inoculation as shown by a rise in the phagocytic index of perhaps more than fifty per cent. within 1 to 6 hours, even when followed by a later negative phase, and other observers had recorded the same. It was on the basis of this observation that he had felt justified in

putting forward the desirability of prophylactic inoculation at the time of an operation or an accident.

Dr Cranston Low referred to his experience with vaccines in skin diseases, and mentioned three conditions, namely (1) staphylococcal infections, (2) acne, and (3) tuberculosis. In the Skin Department of the Royal Infirmary they used primarily stock vaccines, and only in exceptional cases autogenous vaccines. They did not count the opsonic index, but judged merely from the local appearances. Everybody knew that the results in furunculosis were good. If patients with several boils were given a vaccine they nearly always were made worse, for the reason that they were being overdosed; they were already absorbing a great deal of vaccine from their own lesions. A much more reasonable plan was to open the boils and apply Klapp's cup, and, when the acute lesions had gone, use the ordinary vaccine.

With regard to dosage they used to use about 1000 million staphylococci. This was now reduced to about 25 million, and would go still lower. Quite good results were got by small doses, and there was much less risk of doing harm.

Cases of sycosis go on as a rule for a very long time. In the last two or three years they had treated 53 cases of sycosis, and out of that number there were a certain number of cures. A great many injections were necessary—at least 20—spread over a number of months. If the patients would continue the treatment for a sufficient time good results certainly were obtained. In one case of 9 years' duration 5 injections effected a cure; that, however, was exceptional, the average case requiring at least two dozen injections. An important point in such cases was the necessity for local treatment as well, such as X-rays.

He looked upon acne cases as quite separate from staphylococcal infections; clinically and microscopically the conditions are different. A certain amount of suppuration is seen in these cases. The use of staphylococcal vaccine produces no benefit except for secondary infections, *e.g.* boils. They had used in some of these cases the acne bacillus vaccine with the staphylococcal vaccine, and had obtained a result up to a certain point. The vaccine had no effect on the comedones. The explanation of the non-result was that there is practically no circulation round about the comedones, and therefore the antibodies produced by the vaccine never came into contact with the organisms in the comedones.

Within the last three years they had treated 77 cases of tuberculosis of the skin with tuberculin, and the majority of these were lupus. He had not seen a single cure in lupus. They had used almost entirely T.R. in doses of $\frac{1}{1000}$ mgm. The patients got this once a fortnight, and the only result was a diminution in the infiltration. The only advantage it has is that it allows one to see more definitely the extent of the disease and see the isolated nodules and apply local treatment accordingly. They had also used the bacillary emulsion, but with no better result.

In conclusion, he emphasised (1) the importance of not relying on vaccine treatment alone; (2) the importance of prolonged treatment. His experience was that most patients expected to get cured of the condition after one or two injections. If one was not going to carry out the full course of treatment it was not worth while starting. Many hospital patients disappear after one or two injections, not, he supposed, because they were cured, but because they were disappointed that they had not improved more quickly; (3) the dose should be small in the first instance; there was no necessity for any fixed dose—personally he gave a minimum dose and gradually increased it—find out what dose the individual patient can stand, always bearing in mind that you should not produce any local or general reaction.

Dr Carnegie Dickson also joined with the previous speakers in congratulating Dr Ritchie, and only wished that Dr Ritchie, though rightly keeping to general considerations in opening the discussion, had put a little more of himself into it and given his experience as regards his own cases; he was sure he had a large number of very valuable facts available.

Dr Peel Ritchie had referred more especially to dosage. It was, however, not merely a question of size and number of organisms, but, what was still more important, virulence. Even the same organism in and from different cases will give enormously different results. In ordinary staphylococcal treatment one strain will do extremely well and another very badly; one has to choose one's strain. There was no use labelling the tube, say, *Staphylococcus aureus*, one must know one's strain of *Staphylococcus aureus*. The question of virulence is of as much importance as the question of actual numbers.

Most of the speakers, especially Dr Low, had emphasised the importance of giving a small dose and watching the case, a position

with which he (Dr Carnegie Dickson) was in full agreement. He would also strongly appeal for more information from the clinicians who used the vaccines as regards results—Dr Shennan and others who prepared hospital vaccines would back him up in this. Dr Eyre of Guy's Hospital has certain cards printed, and sends them to the wards in which the different patients are being treated, and it is the duty of the physician or surgeon in charge to fill them up and return them to the bacteriologist, who has them tabulated and gets important results in that way. Notwithstanding the large numbers of vaccines they made, they were largely ignorant of the after-results; this was a loss not only to the patients but to science.

Most of his experience had been with very young children, and seemed to be practically identical with that of the previous speakers. Cases of boils often disappear like "snow off a dyke." In cases of mixed infections it was important to isolate the different organisms present. He sometimes used them *seriatim*, sometimes mixed them after separating and standardising them. He had had a considerable number of staphylococcal cases in children, both superficial infections, such as boils and ulcers, and internal infections, such as osteomyelitis cases after operation; these cases usually did well if the conditions were also treated surgically. His other most numerous set of cases were coli infections. In the medical profession at present there was a great difference of opinion as to whether coli infections do well or not with vaccine treatment. His own experience did not help to solve the matter—some did extremely well, some extremely badly. Of course with such cases one never dreams of using a stock vaccine, it must be autogenous. Coli infections, of course, often do extremely well without vaccine, and it is usually only in serious cases, where improvement with other means cannot be got, that one is asked to prepare vaccines.

He would impress upon clinicians outside hospitals that they must get these vaccines from a reliable source. Thus, to mention only one point, they must be certain that they are properly sterilised. He had known two instances where vaccines were proved to be non-sterile and where a generalised infection followed.

Dr Dingwall Fordyce said Dr Ritchie's paper was especially interesting, not so much in the details of treatment as in the attitude

of mind of such a trusted scientist. Two points had struck him—the first was the extent to which he dwelt on the darkness of science as regards the nature of infection, of intoxication, and of tissue reaction; and, secondly, towards the end of his paper, on the opportunity which this means of treatment gives to the charlatan for practice. It seemed to him (Dr Fordyce) that it was necessary and possible to steer between two extremes, and that it was well to realise that, while there is a Scylla of "crass empiricism" on the one side, there is also a Charybdis of *in*exact science on the other. It is only by careful examination of clinical facts that one can get further. The opinions of two very distinguished men whom he had met during the summer—an American and a German—two men who had large experience in this subject in their respective countries, were striking. Professor Howland of New York said his opinion was that staphylococcal vaccines were extremely good in furunculosis, but when one had said that one had said all that was known. Professor Czerny said as the result of his experience he had come to the conclusion that tuberculin was capable of great harm, but it was impossible to say of what value it was as a therapeutic agent.

He (Dr Fordyce) disagreed with both Dr Cranston Low and Dr Carnegie Dickson. The former said in a patient with several boils the vaccine often made the condition worse; the latter said that boils always do well with vaccines. In babies he found that when the furunculosis was primary, staphylococcal vaccine always did good; when secondary to wasting disease such as tuberculosis it did not do good. In multiple boils, where the condition was primary, a vaccine did good; *e.g.* in a recent case there were 37 boils opened by the surgeon and at the same time staphylococcal vaccine was given; no further boils developed, and the child is now free from boils. He had never seen a case of primary furunculosis in the young child where the vaccine did not do good.

Where an empyema was opened and drained, where the discharge was prolonged, and where staphylococci were the secondary infecting agents, a staphylococcus vaccine did good. He agreed entirely with Dr Gulland as to tuberculin. He used it only in afebrile cases of glandular infection. He employed small doses, and he sought to avoid even the slightest reaction. The number of cases in which it is applicable is thus greatly restricted, but such restriction renders it a safe therapeutic agent, and usually its administration gives good results.

Mr Wilkie spoke of vaccine therapy as a prophylactic measure against infection at the time of operation. In this connection vaccines might be employed before operations on parts where certain types of infection are liable to occur. In abdominal cases, where post-operative peritonitis was to be feared, a preliminary injection of vaccines might be used with benefit, though in clinical cases it was very difficult to estimate the extent of that benefit. The type of case he referred to was where an abdominal operation had to be done in two stages, either on account of the bowel being obstructed acutely, necessitating enterostomy, or on account of the operation being particularly serious and it being thought advisable to make it in two stages. If an enterostomy were performed as the first operation, vaccines could be made from cultures from the fæcal matter, and if such were injected, between the primary and secondary operations, he believed a certain amount of resistance to infection at the time of the second operation was obtained. From experimental observations he had found that animals would stand about three times the lethal dose of an organism injected into the peritoneal cavity if they had previously received a dose of a corresponding vaccine supplemented by a dose of nucleic acid. He entirely agreed with Dr Ritchie that vaccination, either as a prophylactic or as a curative measure in acute infections, did not hold out anything like the same prospect of success as did the administration of antitoxin in diphtheria or tetanus. In a case of acute abdominal infection where the patient had been operated on and was in a critical condition it was obvious that he was suffering from a profound toxæmia. The protective forces of such a patient did not require stimulation, they required help. Serum therapy was therefore the more rational treatment for such cases. In cases of chronic suppuration in the abdominal cavity there was usually some mechanical factor interfering with drainage, and no matter how much vaccine might be injected, there would be no real improvement without surgical interference.

With regard to the treatment of mixed infection in tuberculosis, particularly in children, he had obtained good results by using a vaccine of the organism which was the cause of the mixed infection. All the speakers, he was interested to hear, had mentioned that the dosage of vaccines was becoming progressively less. Dr Gulland thought that in children the dose must be extremely small. That was contrary to what he had found in using mixed vaccines, because in no case did he see any reaction whatsoever, although he had given

as large a dose as 300 million bacillus coli, and a like dose of streptococcus to young children. Possibly in these cases the organisms were of low virulence.

Mr W. J. Stuart said that for the last eighteen months, since Dr Struthers Stewart had been on the staff of the Deaconess Hospital, every surgical patient suffering from a bacterial disease had been treated by means of vaccines. A very considerable number of patients—both in-patients and out-patients—had therefore received a course of inoculations by an expert, at such intervals and in such doses as he considered suitable, while both surgeon and vaccine therapist saw them frequently. While a larger number of cases would be required in order to form an opinion regarding the progress of cases of unmixed tubercle under vaccine treatment, he had come to the very definite conclusion that cases of tubercle complicated by pyogenic infection yielded to vaccine therapy in a manner which in many cases exceeded his utmost expectations.

Dr James Ritchie, replying, thanked the members who had spoken and the Society generally for the way in which they had received the paper which he had read. From the discussion he felt he was justified in the positions he took up, which were chiefly —(1) That a case had been made out for the application of vaccine therapy; (2) that the results of vaccine therapy were best estimated by clinical observations; and (3) that vaccine therapy ought never to be applied to diseases the etiology of which was uncertain.

There had been very little said which called for any elaborate reply. He had felt that his part was to open the discussion and to look at the subject perhaps more from the scientific point of view, with a view to eliciting the practical experience of the clinicians, and he thought they had had a very fair representation of that opinion.

To Dr Carnegie Dickson he was much obliged for the suggestion that he should have put more of his own experiences into this paper, but he (Dr Ritchie) suffered in rather a more acute form from what other speakers had complained of, namely, that of all the scores of vaccines which one made one very seldom heard anything definite of the results obtained with them. The only reason one had for suspecting that no harm had been done was that people continued to ask for vaccines. Therefore he had had to confine himself

chiefly to the scientific aspect, and to cite a few cases where, from knowledge of the literature, one felt that a definite statement could be made.

Some remarks by Dr Gulland and also by Dr Cranston Low seemed to indicate that a slight misapprehension had been raised by a statement regarding the way in which vaccines probably act. He had not intended to hint that for the production of the anti-substances in the vaccinated person the vaccine had to reach the focus of infection. What he said was that there exists in the body a general reactive mechanism which may be stimulated by a vaccine, and that the evidence they had of the existence of such a mechanism rests in the changes which occur in the serum as a consequence of immunisation. It was these products which must reach the focus of infection, not the vaccine itself. One or two speakers referred to the toxic nature of the infection. Dr Shennan raised a very interesting point, namely, the relative degree of confinement of the organisms to particular parts of the body which may occur in different diseases. He agreed with Dr Shennan that where there were a great many foci of infection it was probable that the application of a vaccine would be less efficacious than where there was only a single focus. It was, he thought, impossible to make a statement as regards the extremely difficult case of ulcerative endocarditis. In this disease, although there must be constantly a large number of organisms being washed off the heart valve, yet even where there were a number of abscesses in different parts of the body these could not in any way represent the total number of organisms which were washed off. He strongly suspected that the greater number of the organisms which pass into the circulation are actually destroyed in the blood, and that after all the condition is to be looked upon as really one of a single focus of infection. It might be that the resources of the body are taxed to the utmost to kill the organisms which are being washed off, and that there is no possibility for a further stimulation by a vaccine.

Then as to a point referred to by Dr Gulland and other speakers, namely, that in certain cases antisera are preferable to vaccines, he was pleased to hear that statement made, because of recent years there has been too great a tendency to reject the antisera in the treatment of infectious diseases. He quite admitted their power was limited, but since the time when Wright attacked anti-infective sera generally, and said that the only efficacy they could

have was in the way of acting as vaccines, he thought there had been a great tendency to go to the other extreme, and to think of these sera as of no use whatever.

The point raised as regards standardisation by Dr Peel Ritchie and Dr Carnegie Dickson was a very important one, and one he had not gone very fully into in his paper, chiefly from considerations of time. He did not know that there was any aspect of the subject so unsatisfactory as the question of standardisation and dosage. He quite agreed with Dr Carnegie Dickson's criticisms of the method of estimation by weighing. Neither in weighing nor counting was allowance made for the all-important factor, namely, the virulence of the strain of the organism which was being used. Thus none of the present techniques of standardisation vaccines could give an absolute measure of the potency of a vaccine. The only practical method was to start with an extremely small dose and work up.

In conclusion he thought the main point was to bear in mind what he tried to insist upon, that at the present time every vaccination is in the nature of an experiment, and it is an experiment which they must try and control in as scientific a fashion as any laboratory experiment in which patients were not involved. When one found cases of disease which might or might not be bacterial, treated by organisms which might or might not have been present in the patient, and when practitioners in treating mixed infections used mixtures of bacteria, not knowing to what organism the condition was due, one could only agree with the remarks which some of the speakers had made in the course of the discussion, that there is the greatest danger of this treatment being entirely discredited and coming to an end because its limitations have not been recognised.

2. TRAUMA AS A FACTOR IN DISEASE

By Alex. James, M.D.

When an ordinary bar magnet receives a heavy blow from a hammer its magnetism becomes more or less adversely affected, as the result, we say, of changes produced in its molecular condition by the shock or concussion. According to the violence of the blow its demagnetisation will vary in completeness, and similarly according to the violence of the blow there will be variations in its power of recovery.

Except for this change in its magnetism the metal shows no other change which can be demonstrated.

In the same way, when a living tissue is subjected to a concussion its vitality can be diminished or lost temporarily or permanently. Similarly in such a case, if we examine the tissue no other change in its structure may be demonstrable.

Of course there are many differences between the magnetism of a bar of steel and the vitality of a piece of tissue, alike as regards how they can be affected, and as regards their powers of recovery. Thus in living tissue not only may we have the concussion inducing the equivalent of this molecular change, with its associated lessened capacity to nourish itself, and consequent increased vulnerability to organic or toxic products around, but we may have the concussion inducing also breach of continuity of tissue, rupture of blood-vessels, bleedings, etc., and secondary troubles caused thereby.

Furthermore, in living tissue not only may we have this molecular change caused by mechanical concussion or shock, but we may have it caused also by other kinds of injury. Thus chemical shock, as from exposure to noxious or irrespirable gases, electric shock, shocks due to extremes of heat or cold, or shocks due to psychical causes may all be met with. Notwithstanding all this, however, a general analogy between a bar magnet demagnetised by a blow and a living tissue devitalised or paralysed by concussion or shock can appropriately be recognised.

The next point to which attention has to be drawn is that whilst any living tissue may be thus affected by concussion or shock, yet the most immediately serious and the most far-reaching effects for harm are produced when the tissue which is involved is nervous tissue. Thus whilst concussion of a muscle impairs to a greater or less degree its power to contract and to nourish itself, concussion of brain cord or nerve not only impairs function at the affected part—and much more easily because the tissue is more delicate—but because brain cord and nerve form as it were the specialised governing and trophic radiating tissues, it can impair or abolish function in other parts of the body as well, and to a correspondingly great extent. This merits some further explanation and illustration.

Physiology shows us that from the brain and cord there is constantly radiating out along the nerves to the tissues a centrifugal, tonic, trophic, or nutritive influence, in consequence of which

the tissues are able to nourish themselves or build themselves up out of the nutritive material in the blood with which they are supplied. In this way what is called tissue anabolism is brought about. For example, if the nerves to a muscle or a gland be divided or blocked, degenerative changes can soon be recognised passing along the nerve fibres centrifugally, these in their turn being associated with atrophic or degenerative processes in the corresponding tissues, muscle, or gland, or whatever they may be.

But now it must be noted that if this centrifugally radiating trophic force be intensified, it causes in this or that tissue not a tonic or building-up process, but a breaking-down one—the so-called katabolism. With this katabolism is normally associated the manifestation of the function of the tissue, *e.g.* in the muscle, contraction with increased heat production ; in the gland, secretion, with increased heat production.

But the specially important point to be remembered here is that this centrifugally radiating force which, carried out to muscles or glands, can produce in them anabolic or katabolic processes, is the same in kind in both conditions. The illustration of this which I have always made use of is that of the sun's rays falling on a plant. Thus when sunlight in its ordinary diffused form falls on a leaf it causes there an assimilative process, *i.e.* a building up of tissue or anabolism, and this is associated, as we should expect, with deoxidation and a relative lowering of temperature. If, on the other hand, the sunlight concentrated by a lens be made to fall on a leaf, there result a dis-assimilative process—a breaking-down or katabolism—and this in its turn is associated with oxidation and a relative rise of temperature. In this way can be recognised an analogy between the emanations radiating out on the earth from the sun and this nerve force, or, as George Henry Lewis has called it, neurility, radiating out to the tissues from the cerebro-spinal axis.

But again, physiology shows us that from the skin, from the special sense organs, from the muscles, and probably from other tissues as well, a neurility or trophic force must in certain measure be recognised as passing back centripetally to the cerebro-spinal axis, exercising there what may be called a retro-tonic or retro-trophic influence. Thus, if an eye or ear be destroyed, degenerative changes can be recognised passing centripetally to the visual or auditory centres. Similarly, like retro-tonic influences have been

demonstrated from muscles and other tissues. With regard to those latter, whilst much work has been done by recent writers—Kopp, Marinesco, Goldscheider, and others [1]—for the purpose of demonstrating that the integrity of the muscle trophic cells in the cord and other centres in dependent on their being reached by centripetal impulses from the muscles, the experiments of an older writer, Rumpf,[2] are in this connection so clear and definite that they are well worth being recalled.

Rumpf showed that if in the frog the spinal cord was divided at two places, and if the motor nerve roots leading to this separated portion were also divided, this portion became absorbed, and indeed rapidly disappeared. In this way he demonstrated this retrotrophic influence of the muscles on the nerve centres. But Rumpf also found that if a portion of the spinal cord were separated as before, and the sensory nerve roots divided, a similar but less marked absorption of the portion of spinal cord resulted. In this way he showed that from the surface of the body also a trophic influence is passing to the centres. The explanation of this which I have already adduced [3] is that there is in animals an absorption of certain of the solar radiations which impinge upon their surfaces, just as there is in plants, but that whilst in the latter the energy derived therefrom is directly stored up by tissue anabolism, in the former it, after being transformed into neurility, is directly or indirectly stored up as such to manifest itself in the production of anabolic or katabolic processes in this or that tissue or organ, and from time to time, according as the infinitely complex needs of the organism demand. This subject, however, need not detain us longer, but what for our present purpose is important to bear in mind is—(1) that this neurility or nerve force acts in both directions, *i.e.* centrifugally and centripetally, whether the nerve be functionally a motor (efferent) or a sensory (afferent) one ; and (2) that, therefore, when any condition exists which influences morbidly this neurility at any part of the cerebro-spinal axis or nerves, morbid effects produced thereby have to be looked for, and may be traced along both directions.

Bearing all this in mind, we can easily understand how anything which disturbs function at any part of the nervous system may have

[1] Compare Oppenheim's "Text-Book of Nervous Diseases" (Bruce's translation), 1911, p. 66.

[2] Pflüger's "Archives," 1881, p. 415.

[3] *Edinburgh Medical Journal*, vol. xxvii. p. 340.

FIG. 1.—Lily W. on Admission.

FIG. 2.—Lily W. Nine Weeks after Operation.

Onychia—The Result of Nerve Injury.

PLATE I.—TO ILLUSTRATE ARTICLE BY DR JAMES.

the far-reaching and peculiar effects of which some examples are to be found in the following cases :—

The photograph (Fig. 1) represents the condition of onychia which was produced in the thumb, index, and middle fingers of a girl as the result of nerve disturbance. This girl, aged 19, was admitted to my ward 25th November 1902, and told me that this condition of the fingers had started 7 or 8 years before. She first noticed that the three fingers began to feel cold and numb, next a black mark appeared at the root of the nail of the index finger, gradually increased in size, and the nail cracked and fell off. There was much pain in the finger at the time, and the pain extended up the arm and was increased on using the hand. Very soon the thumb and middle finger became affected in the same way, the condition became such as is represented in the photograph, and the patient had to give up work. As can be seen, the finger-nails were greatly thickened, elongated, and curved, the corresponding finger-tips becoming somewhat atrophied.

During the 7 years in which the disease had existed many remedies had been tried—removal of the affected nails, applications of mercurial tar and other ointments, electricity, and X-ray treatment, etc., on the theory that it was a tuberculous onychia. Investigation of the case revealed that with a tubercular family history she had undergone, when 7 years old, several operations for bone disease in the neighbourhood of the elbow-joint. Examination of the elbow showed extensive cicatrisation, and on the theory that the onychia was due to nerve-kinking and irritation the cicatrix was cut down on and the median nerve was found, not in its usual situation, but kinked down close to the internal aspect of the elbow-joint, and fixed in a mass of cicatricial fibrous tissue. The nerve was freed, and even on the day after the operation the patient expressed herself as feeling the arm distinctly better.

The second photograph (Fig. 2) shows the condition 9 weeks after the operation. The affection thus ended in complete recovery, the patient then being able to use the hand for sewing, etc., quite freely.

In this patient it will be noticed there was no real trauma ; the case is adduced, however, as demonstrating the peculiar effects on tissue nutrition which may be induced by conditions of defective or altered neurility, the result of nerve lesion.

The next photographs (Figs. 3 and 4) are of a young man of 23 who was under my charge in the Infirmary many years ago,

suffering from slight rheumatic symptoms. He presented fairly well-marked atrophy of the left side of the face, and of the corresponding side of the tongue, and he told us that this had showed itself first about the age of 14, and had become gradually more and more marked as the years went by. He considered, however, that the wasting had stopped within the last three years. On questioning him we ascertained that he had noticed this hemiatrophy developing some months after he had received a slight cut from a piece of glass in the corresponding cheek. The slight scar which this left was still visible close below the angle of the mouth on the left side.

In this instance the trauma, slight though it was, had possibly been a factor in putting into action those morbid changes in the trophic centres of the face and tongue which had determined the hemiatrophy. As a factor, however, it was probably insignificant in comparison with the constitutional condition of the patient.

The next case is one in which the trauma affected not only the injured side but the opposite side as well. It is that of a healthy looking young soldier, who was admitted to my ward in June 1900 with a marked form of Raynaud's disease (local asphyxia) (see Fig. 5).

The history of this was as follows:—At the fight at Magersfontein on the 11th December 1899 he had had a gunshot wound of the left hand, the bullet, a Mauser one, passing clean through the metacarpo-phalangeal joint of the middle finger. The wound had healed readily, but the injured bones had completely ankylosed, and the whole finger had become absolutely rigid and immovable. About six weeks after the wound he observed that the left hand began to feel numb and cold, and to show more or less constantly a bluish colouration. Shortly after he noticed that similar changes were taking place in the right hand. Accordingly he came to the Royal Infirmary.

On admission a condition of intense lividity was recognised in both hands, extending to about a couple of inches above the wrists, the left showing the condition in a more marked form. The scars of the entrance and exit wounds of the bullet were recognised, and it was evident that in its track and in the parts around there had occurred much fibrous matting of the subcutaneous and deeper tissues. On pressure of the parts from the scars upward towards the wrist some tenderness was elicited, specially on the dorsal aspect. Exposure of the hands to cold aggravated the livid con-

Fig. 3.

Fig. 4.

Plate 2.—To Illustrate Article by Dr James.

dition, whilst heat, as in the Greville hot-air bath, diminished it somewhat. A drop of blood taken from the finger-tip showed a richness in cells and hæmoglobin above the normal, and repeated examinations of it for organisms gave no result. His urine was absolutely normal, he gave no history of shivering or of hæmoglobinuria, and his physical condition otherwise was absolutely satisfactory.

In the belief that the condition in both hands was the result of irritation of nerves by the cicatricial tissue at the site of the wound, the affected finger was amputated, the cicatricial tissue freely opened and removed, and the nerves exposed and freed. The wound rapidly healed, and aided after a few weeks by the employment of the Greville hot-air apparatus, the lividity and other symptoms rapidly disappeared. He was discharged recovered on 17th August 1900.

The next case was that of a lad of 16, a stable boy, who was admitted to my ward on 23rd January 1896 complaining of a pain in the left foot and of weakness in the legs. He had led a healthy life in the country, his surroundings were favourable, and, except for an attack of measles some years before, followed by swelling of some of his neck glands, he had had no previous illnesses. Of his present condition we obtained the following history:—About the middle of July previously he had received a slight injury to his left tarsus from the hoof of a pony. This occasioned him some pain at the time, but he had forgotten all about it until his attention was called to it by our inquiries. He told us that his present illness had begun suddenly about the middle of the previous September. He was walking home from work one night when he was seized with a pain in the left foot. He was not at the time, nor had he been, exerting himself in any way, but was just walking easily along the road. On arriving home he went straight to bed without examining the foot. Next morning the foot was swollen and painful when he tried to walk. He continued at his work for the next three days, and then as the foot was very painful, and showed no signs of improving, he went to a doctor, who pronounced it to be a severe sprain, and ordered rest and bathing with cold, salt water. This treatment was followed for a fortnight, and then the patient was ordered to exercise the foot. The foot, however, became more painful and swollen, so that even with the aid of two sticks he could not get about, although the swelling greatly disappeared. He then got rest again for ten days, after which he

tried to move about with the assistance of two sticks. After trials of various kinds of treatment he came to the surgical out-patient department of the Infirmary. There no surgical ailment was recognisable, but as the legs showed some atrophy, with markedly exaggerated reflexes and stiffness, he was sent to my medical ward.

On his admission there was marked wasting of the left leg and thigh, the left leg measuring 10⅜ ins., the right leg 11⅜ ins.; the left thigh measured 16 ins., the right thigh 17¼ ins. The interesting point further was that both legs were somewhat rigid, and presented extremely well-marked knee-jerks and ankle and knee clonus.

The legs, indeed, presented a condition very similar to that which follows a transverse myelitis, except, of course, that sensation was not impaired. Eventually, tubercular disease of the tarsus was diagnosed and the foot was amputated, and the important point is that in a very short time afterwards the greatly increased reflexes, clonus and stiffness, had all quite disappeared, and except for the amputated foot the boy was well.

This case, which is one of several very similar cases which I have seen, shows how a focus of irritation situated peripherally can profoundly affect the condition of the trophic centres. There seems to me little doubt that had the focus of irritation in this case not been removable, permanent sclerotic changes in the cord would in time have ensued.

The next case is also a good example of trophic disturbances, but whether in it the injury involved the centres in the spinal cord directly or indirectly it is impossible to say.

A miner, aged 35, was admitted to my ward on 18th May 1901, complaining of stiffness in the back and weakness, and of the presence of little swellings under the skin at various parts of the trunk.

About two months before, whilst working in the mine, bent down on his knees, some hundredweight of coal fell upon the top of him. He was knocked flat, falling, however, on some soft dross which, he said, saved his life. He was unconscious for some time, and was helped home. There he vomited some blood, and next day he had melæna. He kept his bed for about two months, and finding at the end of that time that he was still suffering from great stiffness in the back and weakness, he came to hospital.

On examination we found him a healthy, strong-looking man, of good development and muscularity. His height was 5 ft. 7 ins., weight 12 st. 4 lbs. His temperature, pulse-rate, and digestive

Fig. 5.—James L.—Raynaud's Disease.

Plate 3.—To Illustrate Article by Dr James

system were all practically normal. He presented no enlarged lymphatic glands, and his blood film was normal. As regards his circulatory system, all that was noted was that he found himself to be more short of breath than formerly, and that he had felt inclined to faint several times. The heart was found to present a slight amount of enlargement, with a slight systolic murmur, best heard in the mitral and pulmonary areas. This murmur was believed to be functional.

Nervous System.—He complained of pain and stiffness in the spine, from the cervical to the lower dorsal region, and the vertebral spines were somewhat tender to pressure. He had no girdle pain, and cutaneous sensibility all over seemed unimpaired. He presented no nystagmus, and his special senses showed nothing abnormal. His pupils reacted readily to light and accommodation.

His voluntary motor power seemed to be impaired, specially in the right arm. His plantar, abdominal, and epigastric reflexes were absent. The cremaster was slightly present. His knee and ankle jerks were well marked on both sides, specially on the right. His gait was slow but unimpaired to all appearance, and his equilibration (Romberg's symptom) was normal. His organic reflexes were unimpaired, and his urine presented nothing abnormal. The peculiar trophic disturbances in this case were found in connection with the skin. They showed themselves as little swellings, varying in size from a pea to a somewhat flattened plum. These could be felt in the positions indicated in the annexed diagrams (Figs. 6 and 7).

They were freely movable, felt fairly firm, and were painless on pressure. They had come out ever since the accident, and as far as could be ascertained, from the patient's description and from our own observation, they came out in the order marked in the diagrams. On this point, however, we could not be absolutely certain, but Nos. 6, 7, 8, and 9 were only discovered by the patient or by myself during his period of residence in the Infirmary. The largest of them was No. 2, measuring about 2 ins. from side to side, and about 1½ ins. in its vertical diameter. A portion of one of them, excised and examined histologically, showed the structure of a lipoma.

After some 4 weeks' residence in the ward this patient left for home *in statu quo*, and I learned that afterwards paralysis and wasting of the muscles of the legs occurred, and that he died after about a year.

In this patient the results of the trauma on the trophic centres in the cord were such as to induce there irritative atrophic and degenerative changes, but the specially interesting feature in the case was the production at the periphery of what were really tumour growths. As already indicated, it is impossible to say whether in such a case the centres in the spinal cord were involved primarily by the trauma or secondary through the nerve roots or through the results of irritation of the parts around. In passing, therefore,

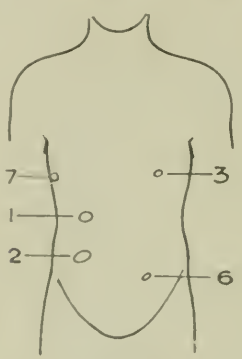

Fig. 6.

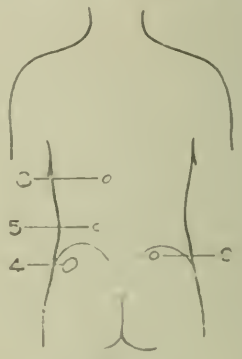

Fig. 7.

next to the consideration of the effects of concussion or shock on the brain, I shall confine myself in the meantime to instances in which the shock was the result of other than mechanical traumas.

Alexander W., aged 65, a station-master, was admitted 14th September 1900, suffering from paralysis agitans of 4½ years' duration. His family history was good, and though exposed to cold and wet he had led a careful and temperate life. He had had an attack of rheumatism about 20 years before. He dates his condition to a severe shock which he had sustained four and a half years ago. At the station of which he was agent—a junction—two trains, both passenger ones, and going about 30 miles an hour, were about to collide. He saw that this was almost certain to happen, and ran along the platform and shifted the points just in time to prevent it. At the time he shook very much all over, but after a day or two he thought he was all right, although he still felt somewhat shaky. About a month afterwards, however, numbness and stiffness and shakings in both hands gradually showed themselves, and this condition gradually passed to his legs.

The disease, paralysis agitans, has been aptly termed a "premature and intense senility," and taking into account this

man's age, the anxious nature of his work, and the fact that he had shown rheumatic symptoms some years before, there is no doubt that the supervention in him of paralysis agitans without any history of shock could not have been considered in any way out of the common. Still he had showed no signs of premature ageing previous to it, and the shock was a profound one, so that it may be regarded as having been a distinctly important factor in bringing on his disease.

Dr Richard Stern [1] in his monograph, gives two good examples of the effects of psychical brain shock. One of them was a man who was of nervous constitution, and who had received an accident for which an operation under chloroform was required. When he was being prepared for the operation, and before chloroform had been administered at all, he died of heart failure. The second was that of a man who was close to a waggon filled with earth which overturned, burying a comrade in the debris. The man went to the spot and tried with his hands to get away the earth. From the shock and the effort he dropped dead. He had probably, however, had old-standing heart trouble.

In his "Mental Physiology" Carpenter has given some striking examples of the effect of mental shock and of mentalisation on the bodily processes. As examples of the influence of mental shock I quote the two following [2]:—

(*a*) "A lady who was watching her little child at play saw a heavy window-sash fall on its hand, cutting off three of the fingers, and she was so much overcome by fright and distress as to be unable to render it any assistance. A surgeon was speedily obtained, who, having dressed the wounds, turned himself to the mother, whom he found seated moaning and complaining of pain in her hand. On examination three fingers, corresponding to those injured in the child, were found to be swollen and inflamed, although they had ailed nothing prior to the accident. In 24 hours incisions were made into them, and pus was evacuated; sloughs were afterwards discharged, and the wounds ultimately healed."

(*b*) "A highly intelligent lady, known to Dr Tuke, related to him that one day she was walking past a public institution and observed a child, in whom she was particularly interested, coming out through an iron gate. She saw that he let go the gate after

[1] "Über traumatische Entstehung innerer Krankheitens," Jena, 1907 ("Krankheiten der Kreislaufsorgane"), pp. 120 and 145.

[2] Carpenter's "Mental Physiology," p. 682.

opening it, and that it seemed likely to close upon him, and concluded that it would do so with such force as to crush the ankle; however this did not happen. 'It was impossible,' she says, 'by word or act to be quick enough to meet the supposed emergency, and in fact I found I could not move, for such intense pain came on in the ankle, corresponding to the one which I thought the boy would have injured, that I could only put my hand on it to lessen its extreme painfulness. I am sure I did not move so as to strain or sprain it. The walk home—a distance of about a quarter of a mile—was very laborious, and on taking off my stocking I found a circle round the ankle, as if it had been painted with red currant juice, with a large spot of the same on the outer part. By morning the whole foot was inflamed, and I was a prisoner to my bed many days.'"

Every physician of experience recognises the powerful influence of the mental condition on the organic functions, and there are few such who cannot call to mind instances of how the course, favourable or unfavourable, of a disease has to all appearance been governed by the mental condition of the patient. But physicians every now and again see instances of disease in which no other conclusion can be arrived at than that it is simply the result of morbid mental conditions. As Carpenter has pointed out, the self-tormenting hypochondriac will imagine himself the victim of any malady that he may fancy, and if this fancy should be sufficiently persistent and engrossing it is not unlikely to lead to real disease of the organ to which it relates.

It follows, therefore, that as it is one of the duties of the doctor to indicate precisely the part played by trauma in causing disease, the doctor must, in any given case, not only know the nature and severity of the accident, and must make himself acquainted with the patient's heredity, constitution, habits, circumstances, and previous health, but he must also take count of the patient's mental attitude. In these days an accident is too apt to be, in one of its aspects, simply a commercial asset, to be negotiated with to the last shilling, and there is no doubt that even the average man, in his perhaps natural anxiety to negotiate to the best advantage, may, by thinking too much on his symptoms, do himself infinitely more harm than the accident itself could ever have done.

It further follows, therefore, that in the study of the subject of trauma and disease an approach to it from the point of view of

disease presents advantages which an approach from the trauma aspect cannot offer.

Discussion

The President said the Society would be glad to hear any remarks on Dr James's very interesting and very characteristic paper.

Dr Edwin Bramwell said he was sorry that Dr James had had to read his paper so late in the evening, when there was little time for a discussion on a subject of so much importance.

A striking instance of the effects of psychical trauma which he (Dr Bramwell) had met with was that of a country bailiff, who, one dark night, unexpectedly came across some poachers. He raised his right arm, either to strike a blow or to defend himself, when, although he was not struck, his arm, he said, fell powerless by his side. When examined a few days later he was found to have a typical hysterical right hemiplegia with hemianalgesia, unilateral involvement of the special senses, and aphonia.

Paralysis agitans had been referred to; he remembered a well-marked case of this disease in a patient who some years previously had fractured his right forearm. The arm had been placed in plaster of Paris for several weeks; the patient stated that the tremor first commenced in this arm, and at the time the plaster of Paris was removed.

Dr Bramwell's experience with regard to tabes coincided with that of Dr James; but he was surprised at the emphasis which had been laid on trauma in relation to disseminated sclerosis, for in a considerable experience of this disease he could not at the time recollect a single instance which he had examined in which trauma could be regarded as of certain etiological moment.

The relationship of trauma to functional disease was a question of special interest, and in this connection one could not fail to be impressed with the prominent rôle played by the "fixed idea" in relation to local symptoms.

As illustrating the "fixed idea," Dr Bramwell cited the case of a patient who had been operated on for mastoid disease on several occasions, more particularly because of severe pain experienced in this region. The character of the pain together with other features of the case suggested that it might be of functional origin and

not dependent upon an organic process; this opinion was verified by its complete and permanent disappearance under psychotherapeutic treatment. Another case recalled by that just mentioned was that of a patient who immediately after a radical mastoid operation developed a paralysis of the contra-lateral arm and leg, with deviation of the tongue to that side, and paralysis of conjugate deviation of the eyes to one side. The symptoms, which had been present for more than a year when first seen by the speaker, were undoubtedly of hysterical origin. Although the patient was unable to move her eyes beyond the middle line, when she was asked to keep her eyes fixed on an object, and the head was passively rotated, it was observed that the conjugate movement of the eyes was perfectly good. When it was pointed out to the patient that the two movements were identical, the paralysis was speedily recovered from, while the paralysis of the tongue and limbs quickly disappeared.

Dr Bramwell also referred to three cases, which he had seen with Mr Wade, of functional flexion of a digit following upon injury or a painful whitlow. After all evidence of local inflammation had passed off, the finger could not be extended, any attempt at movement causing great pain. Two of these patients were rapidly cured by faradising the extensor muscle and thus demonstrating to the patient that the muscle was able to contract.

In conclusion, Dr Bramwell wished to thank the reader of the paper for bringing this most interesting subject before the Society.

Dr James in reply said he was much gratified by the way in which the Society had received the paper. He had also to thank Dr Edwin Bramwell for his remarks. In reading this paper he had been rather hurried, and could not bring out the various points as he would have wished, but he would again emphasise the fact that with accidents as with disease it was to a very great extent the person to whom the accident had occurred that had to be taken into account, rather than the accident itself.

A man might receive a trauma at twenty years of age, and the effects of it not become manifest until he was forty, fifty, or sixty. But during these years the action of many other more important disease-producing factors had usually also to be considered. To decide as to the part played by the accident was a difficult problem to work out as the law at present stood, because, as everyone knew, if it could be made out that the accident had had any effect at all,

it was exactly the same as if the accident had done all the damage. The law required change.

With regard to toxic and functional cases, he had quoted the case of a boy, with tubercular disease of the foot, and a condition like lateral sclerosis in the legs. In this case, when the source of irritation was removed the legs got better, but he wished by this case to illustrate two points :—

(1) That as the result of a peripheral irritation in the foot, the trophic condition of the lumbar cord had been so altered that toxins normally unable to work injuriously there had been able to do so.

(2) That the removal of the peripheral irritation enabled the tissues of the lumbar cord again to withstand the action of such toxins.

In this boy's case, the change in the lumbar cord would be called a functional one, but he had no hesitation in expressing his belief that had the source of irritation not been removed, it would have become organic.

The most important point of all, however, was, What should the medical profession do as regards legislation ? As they all knew, the Employers' Liability Act had aptly been called the Lawyers' Employability Act. The cost was enormous, and the real good to humanity proportionately small. Dr James thought that if the doctors would only set to work and tell the truth in this matter, they could make things better for their fellow-creatures than they were at present.

Meeting V.—February 7, 1912

Mr J. M. Cotterill, *President, in the Chair*

I. Election of Members

R. S. Mowat, M.D., 40 Raeburn Place, Edinburgh, and James Young, M.D., F.R.C.S., 4 Torphichen Street, Edinburgh, were elected Ordinary Members of the Society.

II. Exhibition of Patients

1. *Mr Charles W. Cathcart* showed—

(*a*) Patient after removal of calculus from low down in ureter.

Mrs. R., aged 44, has had frequent attacks of severe renal colic for the last two years. Renal calculus removed in another hospital some months ago. Her attacks, however, continued as before,

and she was sent to Mr Cathcart. An X-ray photograph showed a stone low down in the left ureter. The ureter was exposed by an extra-peritoneal operation, the ureter opened above the brim of the pelvis, and the stone removed with a loop of copper wire mounted on a handle.

(*b*) Fracture of humerus.

Frank B., aged 36, was struck on the anterior and inner aspect of the left upper arm by the handle of a small crane which suddenly sprang back. The humerus was broken by direct violence. The skin was abraded at the seat of the blow, but the fracture was not compound. Admitted shortly after the accident on October 3, 1911. Fracture was set and local splints applied, but the ends of the broken bone could not be kept in exact apposition. Nine days after admission tactile sensation was found to be impaired and weakness of the extensor muscles of wrist and fingers was observed. Massage was being employed daily. Discharged on 14th October, to have massage at 8.0 P.D. On 19th arm was firmer, but loss of power increasing—three weeks after accident. On 25th October tactile sensation remained on back of hand, but owing to almost complete loss of power in extensors the seat of fracture was exposed by operation. The upper fragment was found projecting backwards and the musculo-spiral nerve was found stretched over it and embedded in developing callus. The nerve was dissected out of the callus and the broken ends replaced against each other and fixed with a wire stitch. The upper arm was fixed with splints, and the hand and forearm placed on a splint in over extension of the hand. The extensor muscles have been treated by massage and electricity, and they are now able to keep the hand straight, although as yet there is no power of dorsi flexion. Sensation is now normal except for a patch of partial anæsthesia on the back of the thumb. X-rays shown before and after operation.

2. *Dr G. L. Gulland* showed—

(*a*) Case of myxœdema.

Mrs R., aged 44, complaining of swelling of face, neck, and eyes for three years, with weakness, loss of appetite, and breathlessness. Temperature sub-normal. Face swollen, features coarse. Skin all over dry and thick, not pitting on pressure. Right lobe of thyroid enlarged. Nothing of note in blood or urine. Mitral stenosis. Untreated.

(*b*) Case of TABES DORSALIS.

Mrs B., 53. History of spinal disease seventeen years ago, treated by stretching. No history of syphilis. Argyll-Robertson pupil and Romberg's sign present. General muscular weakness. Absence of deep reflexes. Inco-ordination marked. Indefinite impairment of common sensations. Lymphocytosis in cerebro-spinal fluid. Wassermann reaction negative. Partial paresis of both third nerves. Hemiatrophy of tongue.

3. *Professor Caird* showed—

ENTERO-VESICAL FISTULA.

Male, aged 51. Discussion as to cause. Cystoscopy. Laparotomy. Separation of carcinoma of sigmoid from bladder base. Enterectomy for removal of carcinoma. Closure of bladder wound. End-to-end union of intestine. Appendicostomy.

4. *Dr R. Cranston Low* showed—

Case of XANTHOMA TUBEROSUM MULTIPLEX.

The patient was a girl aged 14 years. The lesions appeared five years ago and had increased in size and number since then. Large raised yellow xanthoma lesions were present symmetrically on the skin, on backs of elbows, buttocks, fronts of knees, and feet; smaller lesions had also recently appeared on left upper eyelid and on the hands. There were also numerous soft lobulated tumour masses covered with normal skin on the tendon sheaths of the fingers of both hands, tendons of triceps and peroneus longus and tendo Achilles. These lesions were also perfectly symmetrical. The patient also had a loud aortic systolic murmur, probably due to xanthoma lesions in endocardium or on aortic valves or aorta. The liver was also slightly enlarged, but there was no jaundice. Patient's general health was good; no glucosuria; no history of similar disease in other members of the family. Two years ago Mr Stiles, to whom Dr Low is indebted for kindly allowing him to show the case, excised a tumour from one of the tendons of the hand and a skin lesion from the elbow. Dr Low showed coloured drawings of sections from the tissues showing typical "xanthoma cells" full of fatty acid ester of cholesterin. Casts made from the patient, 2½ years ago, were also shown to demonstrate how the lesions had increased in size. The excised lesions had not recurred, and Mr Stiles proposed to excise all the lesions on the tendons of fingers because they interfered with the usefulness of the hands. On account of the heart lesion a bad prognosis was given.

III. Original Communications

1. THE TREATMENT OF TUBERCULOUS PERITONITIS IN ADULTS, BY OPERATION

(A Record of 31 Cases)

By F. M. Caird, F.R.C.S.,
Regius Professor of Clinical Surgery, University of Edinburgh

Tuberculous peritonitis is familiar to us as a disease of childhood and infancy. It is rarer in adult life. Thus in the years from March 1900 to the end of 1910, of 6366 adults admitted to the general surgical wards under my charge in the Edinburgh Royal Infirmary we only met with 31 cases of tuberculous peritonitis in patients between thirteen and sixty years of age. We propose discussing and tabulating these cases, presuming that in every instance definite evidence of the nature of the lesion was established. We exclude tabes mesenterica, tuberculous stricture of the intestine, and early examples of tuberculous appendicitis; we include cases showing general invasion of the serous surfaces as the main feature, as also a few in which the Fallopian tubes or ovaries were, in addition, markedly affected, and those in which a general peritoneal tuberculous infiltration seemed to have penetrated from the serous to the deeper layers of the intestinal wall.

The symptoms of tuberculous peritonitis are fairly uniform and well recognised. They are most pronounced in the exudative varieties. The patient complains of swelling of the abdomen, progressive, sometimes slightly intermittent. There is abdominal discomfort and even pain, loss of strength and weight. Constipation is the rule. As distension increases, nausea, vomiting, frequency of micturition and scanty urine appear, respiration and pulse-rate quicken, while temperature shows but little rise, if any. On palpation localised resistant areas and tenderness may be discovered if there be adhesions and infiltrated omentum. The dry varieties exhibit the characteristic "doughy" feeling, and are still more likely to be associated with local tenderness and resistance. When diarrhœa occurs it suggests implication or kinking of the intestine.

The history may assist in diagnosis, as evidenced by the presence of enlarged cervical or axillary lymphatic glands, a tuberculous lung apex, the recollection of a former pleuritic attack, and by information gained as to similar conditions in the immediate relatives. Trauma plays a role in determining the

local growth of tubercle in joints and other localities, but it does not figure as calling forth tuberculous peritonitis. Two patients, however, stated that they had sustained a previous abdominal strain. In two women the condition followed closely upon the last confinement. In one case where a patient had made an excellent recovery after operation for gastric carcinoma (pylorogastrectomy), and in another more recent instance after ruptured gastric ulcer, both returned suffering from tuberculous peritonitis; yet in neither of them was there any indication of tubercle seen at the previous laparotomy. The characters of the fluid removed at a preliminary tapping, and the miscrocopic results attained after centrifuging may clear up a diagnosis by the presence of characteristic cells, etc., in carcinoma and tubercle and their absence in ascites. Rarely does cirrhosis of the liver remain hidden, but we have met with one case in which the rapid onset of ascites (without definite liver symptoms) and the presence of Von Pirquet's reaction led one to an error in diagnosis.

Sex Incidence.—There were thirteen males from 17 to 60 years of age, averaging 32 years, and eighteen females from 13 to 51, averaging 22 years.

In few cases did the diagnosis present any difficulty, although it must be admitted that some of the more elderly were mistaken for examples of malignant peritonitis, and it is still more instructive that the disclosures in laparotomy so closely resembled diffused carcinoma in every respect that it was only the microscopic examination of portions of parietal peritoneum and nodules that demonstrated the true nature of the pathological process. Naturally the after-history was also corroborative. The findings in abdominal section differ in degree, and consist of a series of types which run into one another, but which may be roughly grouped as follows:—

I. Cases in which fluid predominates—the ordinary exudative form.

Ia. The same, plus adhesions, the exudate sometimes encysted.

II. Dry forms without fluid, with or without adhesions.

III. Dry forms in which the peritoneal cavity is practically obliterated or tubercle has invaded the bowel coat, passing from the serosa.

The majority of our patients had already been treated in the medical department without much benefit, and so were referred to the surgical side by the physician. Surgical treatment con-

sisted in an exploratory mesial incision midway between the umbilicus and the symphysis pubis, or, as occasion seemed to demand, in the linea semilunaris or appendicular region. An attempt was made to find and remove any prominent focus, but no laboured or prolonged search was ever regarded as advisable, and on few occasions were tuberculous tubes and ovaries removed or masses of infiltrated omentum. In such cases, or when the exudate was distinctly purulent, drainage was adopted for a short period. As a rule the abdomen was at once closed after evacuating the fluid and freeing such adhesions as could readily be separated. The dry and adhesive form called for operation on account of localised tenderness and the persistence of general symptoms. It was frequently encountered where one expected to meet with an encysted collection of fluid. Manipulative care had to be exercised on incising the thickened peritoneum, which was frequently almost inseparably blended with adherent intestine. In one patient despite special vigilance the bladder was opened. It lay 1½ inches above the pubes and was fused with the peritoneum. In three other cases the separation of adhesions between coils of intestine—the serosa of which was infiltrated with tuberculous nodules—necessitated a double enterectomy in order to remove large portions of friable gut. These cases made a perfect recovery despite the adverse conditions. Fæcal fistula followed simple exploration in two of the purulent cases; one recovered, the other died at home.

Immediate Results of Operation.—Twenty-eight cases recovered. There were there deaths, all amongst the exudative type. Of thirteen males one died—one, M. H., No. 30, æt. 18, an emaciated youth, ill for eighteen months, had a huge hour-glass abscess of the lower part of the abdomen and pouch of Douglas, which contained gas and fæces. Drainage and later enterectomies were required, and he sank in four months from general tuberculosis. Two females died—A. B., No. 28, æt. 20, sank on the sixteen day after operation from general tuberculous peritonitis, tubercle of lung, liver, and spleen; and M. E., No. 23, æt. 17, nineteen days after operation, from general lymphadenitis and peritonitis.

The dry forms, not generally regarded as favourable to surgical interference, all recovered.

It is noteworthy that with the exception of the above fatalities and a couple of patients in whom healing was not followed by marked relief, all the others received benefit from operation.

Remote Results.—As may be anticipated it is no easy matter to follow up the after-history nor yet to ascertain the precise cause of death when that has eventually ensued.

Ten of the twenty-eight patients who left hospital healed cannot be traced. Nine died at varying periods; eight are known to be alive and well—one two years after operation, one three years, one four years, four five years, one nine years.

It is mainly by the ultimate result that the value of treatment is to be gauged, and even if our ultimate results are not brilliant they more than warrant the procedure. We have to bear in mind that the general state of patients suffering from tuberculous peritonitis is below *par*; their powers of nutrition and resistance are low, and the subjects referred by the physician for surgical aid have not greatly profited by previous treatment. Hence the mortality is, all things considered, far from excessive. We would not advocate with König that every case of tuberculous peritonitis should be under surgical care, nor yet can we admit with Borchgrevink that no such case should quit the physician's hands. It is only when medical means fail or appear to be of doubtful utility that surgical intervention is required. It would, however, be advantageous to know precisely what success attends the physician in his treatment of a series of cases in the adult. We confess, and are perhaps to blame, that we did not adopt tuberculin or other than general hygienic measures—adjuvants during or after hospital care.

It is doubtful to what extent the dry varieties of tuberculous peritonitis may be regarded as stages in the cure of exudative forms, since we have only met with one instance where there had been a preceding exudate.

The curative effect of laparotomy has been ascribed to various factors. The removal of a passive injurious effusion, thus relieving the general tension, the favouring influence of the succeeding hyperæmia, the outpouring of an active anti-bactericidal fluid, each or all may play its part. That cell proliferation is encouraged appears evident, and amongst other observations one may recall that of Bumm, who had observed the microscopical appearance and the number of bacilli in the tubercles at a certain laparotomy. He had occasion to reopen the abdomen shortly afterwards, and in the tubercles then removed for examination an invasion by lymphoid cells was observed and disappearance of the bacilli.

The following table illustrates the salient features and history of the individual cases :—

No.	Patient.	Age.	Admission.	Previous History.	Present History.	Operation.	Condition found at Operation.	Immediate Result.	After-History.
1.	H. C	22	28/2/01	Influenza, November 1900. Pneumonia and pleurisy left lung, 1900.	10 weeks. Abdominal pain. Increasing distension and tenderness. Flanks, suprapubic region dull. Resistant mass left hypochondrium.	9/3/01. Drained.	Much clear yellow fluid. Adhesions, tubercles and nodules "like a gravel pit."	Wound granulating.	Fæcal fistula formed June 1901.
2.	R. H	37	18/10/01	Pleurisy 4 months ago.	10 weeks. Swelling of abdomen; vomiting; discomfort. Flanks dull.	18/10/11. Closed.	Much clear brownish fluid. Peritoneal tubercles.	Healed.	Not traced.
3.	Miss M. B.	19	3/12/02	No record.	No record.	4/2/02. Closed.	Failed to enter peritoneal cavity. Dense adhesions. Bladder opened.	Healed.	Not traced.
4.	R. W.	21	15/4/03	No record.	No record.	23/4/3. Closed.	No fluid. Dense adhesions, and tuberculous omentum and nodules.	Healed.	Not traced.
5.	Miss C. H.	18	17/4/03	Enteric fever 1902. Frequent diarrhœa.	4 weeks. Abdominal pain. Increasing abdominal swelling.	17/4/03. Drained.	About 3 quarts clear yellow fluid. Much matting of intestines. Both tubes friable. Removed.	Healed.	Excellent health.
6.	Mrs T.	51	28/11/03	Pott's disease 20 years ago. 17 years discharging sinus left breast, and 17 years nervous dyspepsia. Attacks of jaundice, alternating constipation and diarrhœa last few years. Brother and husband died of phthisis.	20 weeks. Increasing swelling of abdomen, pain, albuminuria, swelling of face, hands, and legs.	1/12/03. Closed.	Much free fluid. Peritoneum studded with carcinoma-like nodules. Mass in right ovarian region.	Healed, but not gaining strength.	Deceased.
7.	J. M'C.	17	20/2/04	Satisfactory. Occasional rheumatic pains.	36 weeks. Weak; pain and swelling in right hypochondrial region, which shows a mobile rounded mass.	26/2/04. Closed.	Extra-peritoneal swelling contained pus. Peritoneum covered with carcinoma-like nodules.	Healed.	Deceased.
8	J. B.	60	18/5/04	Bronchitis 4 years ago.	20 weeks. Vomiting, pain, loss of weight, weakness, swelling in right hypochondrium.	3/5/04. Closed.	Peritoneal tubercles and matting like malignant disease.	Healed.	June 1905 has gained 1st. 3lbs. Very well 1907. 22/2/09 hepatic abscess, chronic bronchitis, cardiac failure

9.	Miss E. D.	29	13/10/04	T.B. glands neck and axilla as child. Recrudescence 6 years ago. Both apices dull.	24 weeks ago. After last confinement progressive swelling of abdomen. Nausea. Flanks dull.	19/10/04. Closed.	Much fluid. Caseating mesenteric glands. Tubercles on omentum.	Healed.	Very well 1/11/05. Not traced since.
10.	Miss **B.** T.	13	14/2/05	Subject to coughs and colds.	4 weeks. Progressive swelling of abdomen. Weakness, loss of weight. Nausea.	18/2/05. Closed.	No fluid. Mass of adhesions.	Healed.	†19/5/05.
11.	Miss M. D.	23	6/3/06	Delicate as child. Weak back; running ear. Mother, brother, and sister died of phthisis. Right apex dull.	16 weeks. Dull abdominal pain. Nausea. Increasing distension.	9/3/06. Closed.	2½ pints yellow fluid. Peritoneal tubercles, felted omentum, covered with tubercles. T.B. glands.	Healed.	Pleurisy 6 months after leaving hospital; since well.
12.	J. M.	44	22/4/06	No record.	7 weeks. After strain of abdominal muscles. Pain and great distension. Œdema of extremities.	22/4/06. Closed.	Peritoneal tubercles and adhesions. Encysted fluid. Pouch of Douglas.	Healed.	Quite well.
13.	Miss A. P.	29	3/10/06	Removal of cæcum, etc., in March; end to end suture for appendicitis tuberculosa.	24 weeks. Loss of weight, weakness, bulging of scar, abdominal pain, and some diarrhœa.	9/10/06. Drained.	Peritoneal tubercles and adhesions. Encysted fluid. Pouch of Douglas.	Healed.	†15/3/07.
14.	Miss I. P.	36	6/11/06	Good till 1904, then sickness and vomiting. Loss of weight. Gastro-pylorectomy for carcinoma 7/10/05.	12 weeks ago. Vomiting and flatulence.	7/11/06. Closed.	Adhesions. Parietal and visceral tubercles. Hyperæmic zones covered with tubercles on jejunum and especially on lower end of ileum and cæcum. Resection of lower end of ileum. Lateral anastomosis with transverse colon.	Healed.	Not traced. Last record undated "Doing well."
15.	W. S.	45	3/12/06	Delicate child. Bronchitis. Influenza 8 years ago. Daughter died of phthisis.	12 weeks. Abdominal pain, weakness, loss of weight, constipated, sometimes vomited.	9/1/06. Closed.	No fluid; no adhesions. Villous and sessile tubercles near parietal and visceral peritoneum. Gritty feeling like carcinoma.	Healed.	†April 1906.
16.	Mrs D. S.	26	9/2/07	Pleurisy 10 years ago. 5 years ago erysipelas.	12 weeks. Abdominal swelling and backache; 3 weeks' vomiting; 2 days' hæmatemesis. Loss of Weight. Tapped twice.	13/2/07. Closed.	Turbid fluid, adhesions, tubercles.	Healed.	†July 1907.

No.	Patient.	Age.	Admission.	Previous History.	Present History.	Operation.	Condition found at Operation.	Immediate Result.	After-History.
17.	Mrs A. A.	23	5/2/07	Bronchitis in childhood. One brother consumptive.	20 weeks. After confinement, loss of weight, nausea, abdominal swelling. Flanks dull. No tenderness. Friction both apices and bases.	13/2/07. Closed.	20 pints greenish fluid. Peritoneal nodules, suggestive of carcinoma.	Healed.	Pulmonary phthisis 18 months after leaving hospital. No return of abdominal affection.
18.	Mrs I. W.	22	17/9/07	No record.	28 weeks. Swelling of abdomen, pain, vomiting, loss of weight and strength.	21/9/07. Closed.	A little free fluid. Visceral and peritoneal surface covered with tubercles.	Healed.	Well.
19.	Miss M. A.	20	1[illegible]/11/07	Intussusception several years.	One year. Abdominal pain, swelling, and tenderness. Diarrhœa, colic, loss of weight and strength. Umbilical deep resistance. Very neurotic.	12/11/07. Closed.	Small intestine matted, fixed posteriorly. Wall of small intestine irregularly infiltrated. No strictures.	Off her head after operation. Healed.	Well.
20.	T. S.	37	15/11/07	Gonal.	14 weeks. Umbilical pain, nausea, vomiting. A cystic swelling extends from abdominal internal ring along cord.	19/11/07. Laid open; incision extended into abdomen; closed. 6/3/08, return of fluid; abdominal incision; douching and closure.	Several pints clear fluid. Tubercles in mesenteries and enlarged lymphatic glands. Brownish fluid. Tubercles over peritoneum.	Healed. Died 17/3/08. Gradual exhaustion and œdema of extremities.	No sectio.
21.	Miss M. T.	13	17/12/07	Gastric fever 4 years ago. Apical pleurisy 1 year ago.	11 weeks. Abdomen swollen, feverish, constipated. Distended abdomen dull below.	20/12/09. Closed.	No fluid. Thickened parietal peritoneum. Parietal and visceral tubercles.	Healed.	Not traced.
22.	Miss M. Y.	16	1[illegible]/1/08	Rheumatic shoulder and side last winter. One brother T.B. glands neck and axilla.	3 years. Progressive swelling of abdomen. Flanks and up to umbilicus dull.	24/1/08. Closed.	Much clear yellow fluid. Tubercles over peritoneum tubes and ovaries.	Healed.	Well.
23.	Miss M. E.	17	25/1/08	Bloodlessness 4 years ago.	Several months ago. Abdominal pain, diarrhœa. Swelling of ankles and abdomen 14 days ago. Nodular masses felt.	28/1/08. Closed.	Some clear fluid. Masses of T.B. glands in mesenteries. Pelvic matting.	19/3/08. Sectio subacute tuberculous lymphadenitis of abdominal glands. Localised tuberculous peritonitis. General peritonitis.	

24.	Miss R. M.	16	23/5/08	No record.	No record.	25/5/08. Closed.	Fluid.	Healed.	Tapped since. General condition now good.
25.	S. H.	21	24/12/08	Good.	4 weeks. Dull abdominal pain. Loss of weight. Tumid abdomen. Dull flanks. Mass in right iliac fossa.	30/12/09. Closed.	Cæcum and glands form a large conflnent mass. Peritoneum covered with tubercles.	Healed.	May 1909.
26.	J. C.	56	23/2/09	Good.	28 weeks. Strain of abdominal wall, August 1908. Epigastric pain, tender abdomen. Resistant mass below umbilicus.	28/2/09. Closed.	No fluid. Matted omentum and intestines. Tubercles.	Healed.	Good health.
27.	Miss I C.	13	25/4/09	Good.	16 months. Sometimes attacks simulating appendicitis. Palpable tender right iliac mass.	28/4/09. Drained.	Adhesions. Intestinal serosa covered with miliary tubercle. Appendix not found.	Fœcal fistula. Healed.	Not traced.
28.	A. B.	29	27/5/09	Good.	4 weeks. Sudden sharp pains hepatic region. Slight jaundice. Loss of weight. Flanks dull. Abdomen tender.	1/6/09. Closed.	Much clear serous fluid. Omentum (removed) infiltrated with tubercle. Tubercles all over intestine and on tip of appendix.	17/6/09. Sectio T.B. peritonitis. Caseation of abdominal glands, more especially at ileo-cæcal angle. Tubercle of lung, liver, and spleen.	
29.	A. C. L.	20	20/10/09	3 years ago T.B. peritonitis. Exudate. 6 months in bed. Treated with Koch's new tuberculin. Recovered.	4 days. Sudden umbilical pain. Vomiting. Dingling abdomen, rather tender below umbilicus.	26/10/09. Drained.	Adhesions. Intestinal serosa infiltrated. Bowel soft and friable. Lacerated. Double enterectomy.	Healed.	Good health.
30.	M. H.	18	3/1/10	Erysipelas 9 years ago.	8 weeks. General swelling of abdomen, pain, tenderness. Diarrhœa. Vomiting.	7/1/10. Drained.	Hour-glass cavity leading into pouch of Douglas filled with fœtid pus and gas. Exploration of cæcal region. Fæcal fistula. Enterectomies later.	21/4/10. Sectio. Tuberculosis.	
31.	Mrs A. G.	24	6/4/10	Husband T.B.	7 days. Abdominal pain.	7/4/10. Closed.	Fluid. Adhesions. Tubercles in intestine (appendix).	Healed.	Well.

Discussion

The President said the Society was deeply indebted to Professor Caird for his paper, which was very interesting and would possibly give rise to an expression of some difference of opinion on the part of surgeons, because, as Professor Caird had said, they had been taught to believe, and he (the President) still thought on good grounds, that to meddle lightly with the adhesive form is neither a desirable nor a safe procedure. He gathered that Professor Caird led them to understand that he would only interfere with an adhesive case when it came under the "dry" form, in order to liberate fluid, or some temporary condition, such as a kink, causing acute symptoms. The President did not quite understand whether the author said he would deliberately open an absolutely dry case with, presumably, adhesions, and, if so, to what extent he would attempt to liberate the bowels from each other.

The question of tuberculous peritonitis following operation was a very interesting one; it was new to him, and he supposed Professor Caird was absolutely certain that the primary lesion for which he did the operation was not tuberculous. They knew that conditions which looked extremely like malignant disease did not always turn out malignant. It was very startling to hear that tuberculous peritonitis may follow an operation on a non-tuberculous abdomen. A case which occurred to him was that of a young man, about 15, who had a strangulated hernia and also a very swollen abdomen in an acute condition: operation had to be performed for the hernia, which was on the right side. The peritoneal sac was found to be studded all over with tubercle, and, as has happened to other surgeons, the effect of putting the hernia right and opening the abdominal cavity cured the patient not only of his hernia but of his tuberculous peritonitis; some years afterwards he was again seen and found to be in perfect health as regards the tuberculous peritonitis.

Sir James Affleck said the subject was extremely interesting and one in which physicians were deeply interested. He thanked Professor Caird for bringing it before them. He had had to deal with a good many such cases, and quite agreed that medical treatment ought to have a good trial, because one must remember that a considerable number of cases of tuberculous peritonitis undergo

spontaneous cure, or, at all events, spontaneous arrest. The diagnosis was not always easy, although pretty frequently one could make out with considerable accuracy the existence of tuberculous peritonitis, particularly in young adult females. The case that was perhaps the means of giving a lead to surgery was that of Sir Spencer Wells, the ovariotomist, which occurred in the early sixties. A young lady was put under his care for an ovarian tumour; instead of finding an ovarian tumour, the abdomen was found to be full of fluid, and the whole surface studded over with tubercle. The wound was closed and the patient sent home to die, but instead of dying she recovered, and lived for a considerable number of years.

Sir James Affleck had had experience both in young people and in adults, and found that better results, on the whole, were obtained in patients under 12 years of age. One of the first cases in the Royal Infirmary, among the early cases, was an industrial schoolboy of 12 or 13, who was brought with a very much swollen abdomen, and a history very suggestive of tuberculosis. The abdomen was opened and a large quantity of fluid evacuated. The patient made a good recovery. Professor Caird referred to the great difficulty of tracing cases of this kind, but this boy's mother had occasion to come to see Sir James Affleck some six or seven years afterwards, and, in answer to inquiries about her son, said he was in Malta and "a Sergeant in a Hielant Regiment."

In adults his experience of surgical interference was not very favourable. The cases he thought one would rather shun operating upon were those where the peritonitis was accompanied by evidence of invasion of the membrane—where there was much diarrhœa; cases where there was a considerable amount of opalescent fluid and no evidence of affection of the membrane did best in his opinion. The dry cases, in his experience, did not do well; he was glad to hear that Professor Caird's cases of non-adhesive peritonitis have been successful. Sir James Affleck had seen one or two cases of fæcal fistula following this dry condition. In watching surgeons operating he had noticed that the whole omentum and adjacent parts of the intestine were often matted together to an extreme degree, and the great danger was the risk of damaging the intestine.

Mr David Wallace wished to add his quota of thanks to Professor Caird for his interesting paper. There were three points

he would briefly allude to. The first point was the importance of early operation. Mr Wallace thought that was just one of the questions of much interest in this subject of tuberculous peritonitis. Is it not because the cases have been so long under treatment and have advanced so far that it is difficult to find the initial focus which is the cause of the peritoneal tuberculosis? His own feeling was that when a case does not show somewhat rapid improvement under medical care it should be at once sent to the surgeon, because, as Professor Caird's experience showed, the majority of these cases did extremely well; out of 31 cases reported, 27 at least recovered; these were unselected cases and the patients were very ill indeed. It had been shown by some surgeons that the removal of the primary focus is followed by greater success than if the focus cannot be found; also the more adhesions one has to deal with the less likely is the primary focus to be found. The second point to which he wished to refer is the importance of removing the primary focus. The third point referred to cases with adhesions. In these cases, in his experience, considerable success was obtained: he had had less success where there had been large quantities of fluid than where there had been adhesive peritonitis. Both Professor Caird and Sir James Affleck had referred to the difficulty of getting into the peritoneal cavity where there were extensive adhesions, and yet in these cases after opening the abdomen it was wonderful the improvement which occurred. The danger after operation is, of course, fæcal fistula, and in one or two cases as long as ten days afterwards he had had a fæcal fistula form; in one case where this happened the patient made a very excellent recovery.

Mr H. J. Stiles said they were very much indebted to Professor Caird for bringing his cases before the Society; it was only from a man who had had a great deal of experience in such cases one could learn of the benefit of the treatment. On looking into the literature one was rather at sea on this point, and personally he was a very strong believer in the one-man statistics—if one knows the man.

Several points mentioned were exceedingly important. The first is the difficulty that there sometimes is in diagnosing malignant disease from tuberculous disease. In one of his earliest gastrostomies for pyloric disease, the appearances were typical of carcinoma; the abdomen was closed and the case regarded as hopeless. The patient had consulted various authorities, especially

abroad. In order to make sure of the condition, Mr Stiles cut out one of the little nodules in the stomach wall and was surprised and delighted to find it was tuberculous. That patient is now quite well, and some years have elapsed since the operation. These cases were, however, exceedingly rare.

The second point Mr Caird mentioned incidentally, namely, that some of the patients suffered from apical disease of the lung as well. That interested him particularly; he would like to know if these cases were human rather than bovine tuberculosis. He should have liked to know what the proportion of human and bovine tuberculosis was. But no doubt when the operations were done the means of distinguishing these two forms were unknown.

The third point was the kind of case which gives the best results. Although he had not had Professor Caird's experience of adult cases, he had had a good deal of experience with children, and in them the dry form had given the best results by far. In cases where there was a great deal of fluid, more especially if the tuberculosis is acute, he was opposed to operation. As Sir James Affleck had said, where there is diarrhœa, it is wiser not to operate. In children, if he was satisfied that the disease was acute, he did not operate unless for some urgent complication.

What sort of cases Mr Wallace was driving at he failed to understand. He presumed Professor Caird was not dealing with localised forms but with those cases which had become diffuse. One cannot therefore find the primary seat of the lesion, and, if one did, one cannot perhaps remove it, except perhaps in the female where the disease has originated in the Fallopian tube.

He could not give the statistics in the Children's Hospital, as he had no idea what proportion of cases were operated on. The physicians treated cases in the medical wards; he believed that in the dry form, and especially in tabes mesenterica, the results are good; he was only asked to operate when the case was severe. If cases in the medical wards are "hanging fire," he thought in these circumstances an operation was of great value and turned the scales to recovery.

Mr Scott Carmichael joined with the previous speakers in thanking Professor Caird for his paper. Professor Caird at the commencement made one remark with which he disagreed, namely, the question of infection in the female—he indicated that the female genital organs were the primary source, the peritoneal tuberculosis

being secondary. The evidence of gynecologists and others working at this subject nowadays is that it is not so. In a large number of cases of peritoneal tuberculosis at the Children's Hospital he examined the Fallopian tubes and uterine cavity, and in none of them could he demonstrate any tubercle. Again, one must remember that uterine tuberculosis is a comparatively uncommon condition. All the evidence now goes to show that tuberculosis of the genital organs is a descending and not an ascending affection.

Another point of extreme interest is the finding of peritoneal tuberculosis in a hernial sac. In 9 cases out of 400 or 500, he had found this condition. In 2 private cases on which he had operated, and which had been under observation ever since, he had not suspected it, and there were no physical signs nor evidence of peritoneal tuberculosis; in neither of these cases did the patients develop symptoms or signs subsequently.

As regards prognosis in the dry as compared with the fluid form, it had always seemed to him that in the dry form one was dealing simply with a further stage of the disease. The fluid form is acute, the dry more chronic, and the treatment and prognosis are very much better in the dry than in the fluid form, unless some mechanical interference takes place as the result of these adhesions. Some six months ago a man was sent to Mr Hodsdon's ward supposed to be suffering from acute appendicitis—there was a great deal of abdominal pain on the right side with a rise of temperature, and the symptoms certainly suggested appendicitis. On operating in the usual position he was unable to get into the peritoneal cavity at all. There was a most remarkable condition: the coils of the intestine appeared to be stuck together by stiff, sticky adhesions, not like the adhesions in children, this appearance in adults being one with which he was not familiar.

Dr Borrowman said Professor Caird mentioned that two of his cases died of very rapid general tuberculosis following the operation. Did this occur often? He was much interested in this point because a number of years ago a patient of his, a little boy, immediately after the operation developed a very acute general tuberculosis—meningitis and a pulmonary condition as well—and died in a very short time. The question is, Does the operation disturb the tuberculous focus and distribute it through the body? Is this a danger in this operation?

Dr William Russell only wished to ask Professor Caird a question, because physicians had to be guided by the dicta of the surgeons. He thought he (Dr Russell) knew a little about modern surgery, but he was anxious to be assured that it is not a surgical dictum that only the wet cases are to be operated on. He would like to know that they could with propriety hand these cases over to the surgeon with the hope of very marked benefit. The physicians had no desire to keep them unduly on their hands if the surgeons are willing to operate on these diffuse cases of tuberculous peritonitis ; if Professor Caird's results are to be relied on, it is quite clear that recovery, even in the dry cases, is much more rapid than by any other method of treatment. His (Dr Russell's) experience of operations was in the wet cases, and some of the results in such cases have been so brilliant, that as soon as one diagnoses tuberculous peritonitis with fluid, one at once asks the surgeon to operate as being the most rapid and efficacious method of treating the patient.

Mr Wallace was inclined to go a little farther and speak about the tuberculous focus. Dr Russell asked Professor Caird if there really always is a tuberculous focus in diffuse tuberculous peritonitis, for his conception of diffuse tuberculosis was that it was an infection usually right through the membrane of the intestine, and was not a condition in which one could show that there was a definite focus. The only cases of definite focus he knew of were cases of tuberculous peritonitis complicated with, and often beginning in, a tuberculous ulceration of the intestine ; in these cases, the operation while relieving and improving the condition, does not necessarily lead to healing of the tuberculous ulceration of the intestine, and the patient may die of this condition while the peritoneal condition may be recovered from. He remembered Professor Chiene operating on a case of this kind, where the peritoneal condition was recovered from but where the patient died some months later from the intestinal condition.

Mr Alexander Miles said when Professor Caird sat down he (Mr Miles) was quite clear as to what he meant by " recovery " ; but subsequent speakers had used the term in a different sense. Professor Caird spoke of operation recovery, not of complete recovery from the disease. Of course in the dry form of peritonitis one would expect a greater proportion of operative recoveries because already these cases are in the process of recovery, and the

operation performed is very slight. There is nothing to make the patient die from the operation. In the fluid form one is dealing with an acute peritonitis without evacuation, and even after letting out the fluid a considerable risk of the patient dying from the disease still remains. He wished to make it clear that surgeons do not claim the very favourable ultimate results that some of the speakers seemed to indicate.

Professor Caird, in reply, thanked the Society for the kind way in which they had received his paper. What led him to write on this subject was, firstly, the relative frequency of the condition. He had taken his cases from a period of ten years, and only the cases in which the diagnosis was absolutely verified by microscopic examination were included; those which were inflammatory, but which he believed were really tuberculous, had been omitted. In the majority of these cases the difference between bovine and human tuberculosis was not established. His second reason was the difficulty of believing the statistics given in books — some people bring forward 200, 300, or 500 cases; it was only when one got to the original papers that one could get any correct idea. Again, the books left one in ignorance as regards recovery. The mere fact that the patient heals and lives is not a case of recovery; just as in malignant disease, one has to look ahead and see the patient well three years later before one can speak of recovery, if indeed then, although it may be a complete recovery as far as the cavity of the abdomen is concerned. Sir James Affleck mentioned Sir Spencer Wells' case where the patient lived for 25 years. It was not till 1884 Hamman laid down the dictum, Whenever you make a diagnosis of tuberculous peritonitis then call in the surgeon. Following that there was presumably a great invasion of the peritoneum. Then in 1889, a physician pointed out that the surgeon had no business to interfere, and that if the patients were left alone and ordinary treatment followed, there would be a spontaneous cure in 86 per cent. of cases. This statement remained unchallenged for a considerable period. Professor Caird was of opinion that one should allow the patient to go to the physician and, if the physician approves, let them come to the surgeon; there was no need of being in a hurry to rush to the surgeon, as Hamman suggested in 1884: there is a happy medium.

The President asked if he deliberately operated on the dry forms. The statement had been made, and was generally accepted,

that the dry forms are curative forms which are getting better. He could not remember a single one of the dry forms in which the condition had begun with swelling of the abdomen, and if all these dry forms are curative forms, it is curious that the condition did not begin with fluid and then go on to the dry form. The dry forms might or might not be curative. They present the striking difference that frequently the tuberculous process is on the surface of the serous membrane and is making its way from the serous to the mucous surface. In the cases which begin on the mucous surface one does not find a plastic tuberculosis; not only are the lymphatic glands enlarged, but there is a very great exudation. In the dry form, where there are caseous nodules beginning on the outside and later invasion of the intestine, strictures are not developed although there may be kinks. The President also drew attention to the incidence of tuberculosis after certain operations—in his case hernia. That was an operative coincidence. It may be that there is already a focus somewhere else, and the organism having travelled to a certain part, the condition is set up. He also suggested that the condition for which the laparotomy was performed might induce the tuberculosis. In regard to carcinoma, it might quite well be that tuberculous bacilli had escaped, but the primary condition was carcinoma: it was a mere coincidence. Then the President asked why did he operate in dry forms? That question was difficult to answer. Firstly, the patient was not getting better, and one felt that it would be well to do something; and, secondly, that there were soft and tender areas and perhaps an encysted accumulation. These cases were somewhat different from those in which there is fluid; in many of these cases they believed they were going to let out some encysted fluid.

Mr Wallace spoke of the initial focus. A number of writers, particularly American writers, lay stress on the removal of the initial focus. In the great majority of instances one failed to find it. Too much was heard about the focus! The focus has disappeared by the time the abdomen is opened. He thought that the wiser writers held that it was better to leave it alone, rather than to look about for a thing which was practically non-existent. The focus has been swallowed up in the general condition.

With regard to the difficulty of diagnosis where one was dealing with malignant disease, Professor Caird confessed that tuberculous peritonitis mimicked malignant disease more nearly than any other condition. It was an extremely difficult question to differentiate

the two, although when there is a primary focus and a general peritonitis it is by no means so difficult. It was different with the pylorus: in one or two of the earlier cases there was a doubt, but in the later cases not the slightest, as to whether it was malignant or non-malignant.

Mr Stiles also got his best results in the dry form. Mr Scott Carmichael referred to the vaginal sac. In only one of Professor Caird's cases was there tuberculosis of the vaginal sac, and that patient ultimately succumbed to a general tuberculosis.

Dr Borrowman asked if the operation might have given rise to subsequent tuberculosis. Professor Caird was of opinion that the tuberculosis was present before the operation, and perhaps became more pronounced as time went on.

It was interesting to hear from Dr Russell that the physician is ready to bow to the surgeon; he thought the surgeon was quite as willing to return the compliment.

Professor Caird remembered Professor Chiene operating on the case of a perfectly healthy student who, one day, while crossing the Pentlands, felt his trousers tight; the next morning they would not meet. The abdomen was found to be full of fluid, and tuberculous peritonitis was diagnosed. An incision was made and fluid evacuated. Now, twenty-five years afterwards, the gentleman is in prime health and well up in the Indian Service.

Mr Miles' remarks on the question of recovery were very interesting.

2. ORTHORADIOGRAPHY OF THE HEART AND AORTA

By W. Hope Fowler, M.B., F.R.C.S., Senior Medical Officer in Charge of the Electrical Department, Royal Infirmary, and W. T. Ritchie, M.D., F.R.C.P., Assistant-Physician, Royal Infirmary

Apparatus and Technique.—The source of energy we employ for the X-ray tubes is a Snook High Tension Transformer. The orthoradiograph is Groedel's modification of the Levy-Dorn apparatus.

The Snook apparatus, invented by Snook of Philadelphia, introduced by Dr Leonard into this country, and made by Newton of London, enables this work to be carried on with a minimum of difficulty. It consists of three parts.—The main current, a constant one, is converted into an alternating one by means of a motor convertor or inverted rotary. This interrupted current is led into

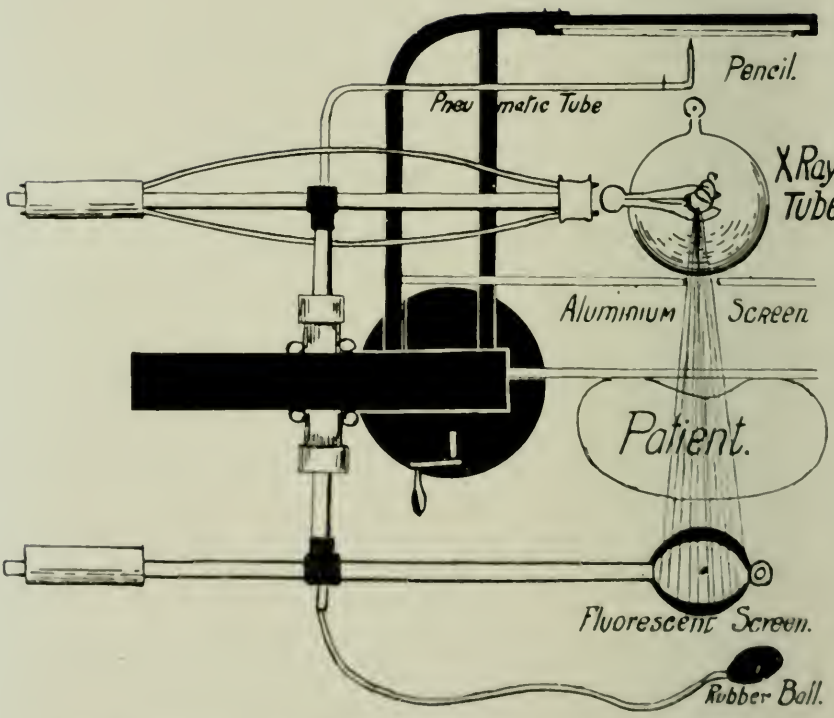

FIG. 1.—Diagram of Groedel's Modification of the Levy-Dorn Orthoradiograph.

PLATE 4.—TO ILLUSTRATE ARTICLE BY MR FOWLER AND DR RITCHIE

the primary of a step-up transformer, which is immersed bodily in a galvanised iron tank filled with an insulating oil. The secondary current is conducted to the high tension rectifier, which, being on the same axle as the rotary, permits of our using the current of right polarity to light up the X-ray tube.

It is possible at the same time to make use of the inverse, or current of wrong polarity, but it is better to eliminate that by a simple arrangement of switches. In the secondary circuit there is developed a current of 10,000 to 125,000 volts, at a milliamperage of 1.5 to 30 or 40 m.a., therefore useful for all purposes—radioscopy, instantaneous or distance radiography. With a current strength of from 2.5 to 5 m.a. we can keep our tubes working for lengthy periods without damage.

The Groedel modification of the Levy-Dorn apparatus, a diagram of which is shown in Fig. 1, consists, firstly, of a heavy upright supporting a quadrilateral framework, in which move the supports bearing the two arms on which are fixed the tube and screen, so balanced that it is a simple matter to move screen and tube in all directions in reference to the patient. The centre of the tube, centre of screen, and pneumatic pen are brought into alignment and firmly fixed. The resultant is a parallel projection of rays, which is carried round the organ under examination, and the outline is made by means of the pen on a sheet of paper fixed to the havy board at the back of apparatus.

To sum up, by the term orthoradiography is meant the more or less exact measurement of various objects, outlines of which are thrown on to a fluorescent screen by a pencil of X-rays. To obviate the distortion produced by the X-rays, which are propagated from the focal point of the anticathode in straight lines in the form of a divergent cone, it is necessary first of all to eliminate all but the central or ray of normal incidence, and after finding this, it is carried round the outline of the object, in this case the heart and great vessels, and a record is made of the silhouette.

Technique.—If satisfactory observations are to be made, it is necessary that the room in which the examination is conducted should be absolutely dark. Even a small amount of light issuing from any source in front of the observer tends to render his work more difficult and his results less reliable. While each examination is being made, the patient, stripped to the waist, is sitting erect on the orthodiagraph chair, and he faces the fluorescent screen and the observer, so that the sagittal direction of the rays

is dorso-ventral. In order to keep the patient's body as far as possible in one fixed position during the whole observation, the clamps at each side of the orthodiagraph chair are firmly applied either to the chest wall or to the upper arms kept in apposition with the latter. The observer, having put on his protective lead-rubber apron and gloves and lead-glass spectacles, sits on a high stool in front of the patient and adjusts the fluorescent screen so that it is as close as possible to the anterior surface of the patient's chest without actually touching it. The lights are then switched off. After absolute darkness has been maintained for about five minutes, in order to render the observer's retina as sensitive as possible, he takes the fluorescent screen in one hand and the bulb of the pneumatic pen in the other; the tube is lighted up, and the observation commences.

At the start the screen is moved rapidly in front of the whole precordial region in order to obtain a general idea of the position, form, and size of the patient's heart. After this preliminary inspection, which need not last more than a few seconds, the patient is directed to hold his breath, and the record is taken. We commence by marking from right to left the upper border of the liver. The fluorescent screen is moved so that its opaque lead central spot coincides in succession with points upon the upper margin of the shadow of the liver, and each of those points is marked upon the surface of the paper by means of the pneumatic pen. The screen is then carried upwards, its central spot following the right margin of the shadow of the heart and great vessels, then over the apex of the right lung and down its outer margin to the starting-point. The patient is now directed to breathe once or twice, and then to hold his breath again, in the same phase of respiration as that obtaining previously. While he does so the upper limit of the diaphragm on the left side, the outer border and apex of the left lung, and the left margin of the shadow thrown by the great vessels and the heart are marked successively on the paper. We find it most satisfactory to take the record at moments corresponding to full diastole and while the patient is holding his breath at the end of a tranquil inspiration, and subsequently, before switching off, to record the chief points of the cardiac outline during full inspiration and full expiration respectively. If the observer has had some experience in the technique, and if the case presents no special difficulty, such as that occasioned by pulmonary œdema, pleural thickening, or enlarged mediastinal

glands, the time required to obtain a simple record of the outline of the heart, lungs, and diaphragm need not exceed thirty seconds. A somewhat longer time is necessarily required if we desire to record the form of the heart during different phases of respiration.

The current having been switched off, the lights are turned on, the percussion outlines of the heart and liver are mapped out upon the patient's chest wall, the fluorescent screen is replaced by the pointer, and by means of the latter, together with the pneumatic pen, the surface outline of the patient's chest, the percussion outlines and important landmarks, such as the episternal notch, the level of the third chondro-sternal articulation, the nipples, the apex-beat, the xiphisternum, the umbilicus, and the lower margins of the ribs anteriorly are marked upon the paper. In many instances it is well to supplement the dorso-ventral examination by screening the patient in various oblique positions, in order to determine more fully the relative size of the different cardiac chambers and to confirm or disprove the presence of an aortic aneurysm.

The Normal Heart.—On dorso-ventral illumination the lateral outlines of the normal heart are clearly and sharply demarcated by contrast with the clear area of the lung on either side. The cardiac outline, although varying somewhat in different patients, according to the sex, age, and weight of the person, the conformation of the chest, and the position of the diaphragm, is of ovoid form, with its long axis directed obliquely downwards from right to left. On frontal illumination the long axis is directed from above downwards and forwards. On dorso-ventral illumination the long axis tends to be vertical in young persons, whereas it is more horizontal in old age. On the right side the outline presents two curves (Fig. 2). The right lower curve is formed by the right auricle. We regard the right upper curve as being formed by the superior vena cava, and not by the aorta, as stated by Franz M. Groedel.[1] The feeble pulsation or the frequent absence of pulsation in the right upper curve in health are presumptive evidence that the normal aorta does not take part in the formation of this curve; and of the correctness of this belief we have satisfied ourselves by inspection of the relations of the superior vena cava and aorta in the cadaver. On the left side there are three, or sometimes four, curves, formed from below upwards by the left ventricle, the left auricular appendix, the conus arteriosus or pulmonary artery,

and the arch of the aorta (Fig. 2). In one case of mitral disease with auricular fibrillation the curves which we had marked as left auricular and pulmonary were found at the post-mortem examination to be formed by the left auricular appendix and conus arteriosus respectively. In another case, one of exophthalmic goitre with marked chronic interstitial myocarditis, the four orthodiagraphic curves on the left side were seen post mortem to be constituted by the left ventricle, the conus arteriosus, the pulmonary artery, and the aorta. In this case the left auricular appendix lay wholly behind the heart.

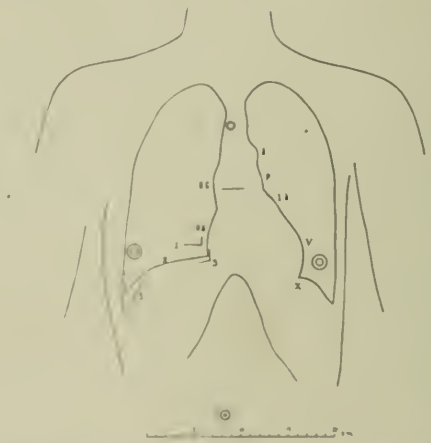

FIG. 2.—NORMAL HEART, FEMALE PATIENT, AGED 32.

1. In deep expiration. 2. In tranquil inspiration. 3. In deep inspiration.

A, Curve of aorta. *P*, Pulmonary curve. *LA*, Left auricular curve. *V*, Left ventricular curve. *SC*, Curve of superior vena cava. *RA*, Curve of right auricle. The position of the episternal notch, level of third chondro-sternal articulation, the nipples and umbilicus shown. *X* indicates the position of the apex-beat.

With the exception of the right upper curve, which is not infrequently somewhat difficult to demarcate precisely, all the curves are clearly defined on the orthodiagraph screen. The left auricular curve in health is often small and inconspicuous. The normal pulmonary curve is larger than the left auricular, but it does not project outwards very prominently. The aortic curve is more marked in adults than in youth, and becomes more pronounced in old age, but the curve of the normal aorta never extends upwards beyond the episternal notch.

Pulsations.—The extent of pulsation of the right auricle, as revealed by the systolic and diastolic excursions of the right lower curve, is slight. In the right upper curve of healthy persons pul-

sation is either wholly absent or very feeble. There is usually a striking contrast between this phenomenon and the obvious jugular pulsation in the right side of the neck when the patient is recumbent; probably the difference is mainly of postural origin. On the left side the pulsation of the aortic curve is normally greater than that of the pulmonary. The left auricular curve, if present, manifests merely slight pulsatile movement, which it is usually difficult to time definitely as presystolic. The left ventricular curve exhibits the most extensive pulsation. This is particularly evident in the apical portion of the ventricle, where the difference between the margin of the cardiac shadow in systole and in diastole may exceed 1 cm. The apex is the most difficult part of the ventricle to define exactly, for its shadow not merely manifests more ample pulsatile movements, but is also fainter than that of the rest of the ventricle.

Respiratory Movements.—The respiratory movements of the heart are more extensive than the pulsatile. The heart is indeed a freely mobile organ. A consideration of the anatomical relations of the heart, pericardium, and diaphragm indicates that during inspiration the heart becomes longer and narrower, both the apex and the right auriculo-hepatic angle moving downwards and inwards. During expiration, on the contrary, the heart becomes shorter and broader. During tranquil respiration these changes in the form of the heart are more evident at the apex than on the right side, and are of comparatively limited extent. On deep respiration the change in form is much more obvious, and affects not only the apex and left border, but also the auriculo-hepatic angle and right border of the heart. Fig. 3 illustrates the change of the heart's outline during deep respiration. In this instance the right auriculo-hepatic angle moved 3.2 cm. upwards between full inspiration and full expiration, while the ventriculo-diaphragmatic angle on the left side moved 4.2 cm. upwards and 2.3 cm. outwards, and the main portion of the border of the left ventricle above the apex lay 2.0 cm. further to the left in full expiration than in full inspiration. In another case, a healthy medical man, aged twenty-six, the full respiratory excursion of the right auriculo-hepatic angle was 4.5 cm. and that of the left ventriculo-hepatic angle was 3.8 cm. in the vertical plane, while the respiratory excursion of the left border was 2.5 cm. in the horizontal plane. In other instances the respiratory excursion of the left border did not exceed 1 cm., and in some patients with comparatively limited diaphrag-

matic movements the respiratory excursion of the left border of the heart did not exceed half a centimetre. As a rule, however, the form of the cardiac outline changes in a striking manner with each deep respiration, and as tranquil respiration is associated with changes of similar nature, although of lesser degree, it is evident that an orthodiagram of a heart loses much of its value, and may even be misleading, if we do not know in what phase of respiration the record was obtained.

Measurements.—Groedel's [1] methods of measuring the orthodiagraphic silhouette are the simplest and most satisfactory. The

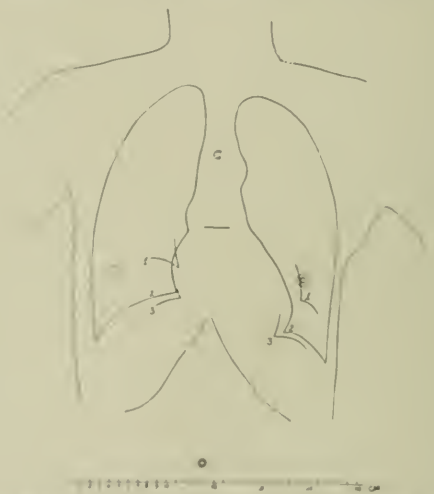

FIG. 3.—MEDICAL STUDENT, AGED 22, TOBACCO ANGINA.
1. 10 deep expiration. 2. End of tranquil inspiration. 3. Deep inspiration.

long diameter (L.D.) is the distance of the superior cavo-auricular angle from the apex. The maximum distance of the right and left borders respectively (M.R. and M.L.) from the mesial line are also measured, and the sum of these constitutes the transverse diameter (T.D.). The ratio between the size of the heart and the height of the individual is inconstant; that between the size of the heart and the body weight is more constant. Even in health, however, the actual measurements of the heart vary within considerable limits. That the chief factors determining these differences are the sex, age, and weight of the individual is shown by the tables recorded by Groedel,[1] and by Claytor and Merrill.[2] According to Groedel, the average figures for healthy males are L.D. 14.0, M.R. 4.6, M.L. 8.4, T.D. 13.0; and for females—

L.D. 12.9, M.R. 3.9, M.L. 8.0, T.D. 11.9 cm. Claytor and Merrill give the following as average measurements for healthy males :— L.D. 13.7, M.R. 4.0, M.L. 8.1, T.D. 12.1 cm. ; and for females— L.D. 12.5, M.R. 3.4, M.L. 7.8, T.D. 11.1 cm. We have used these figures as rough standards wherewith to compare the measurements of our own series of cases. In some instances we have also employed the method of Levy-Dorn and Möller,[3] who take measurements from the patient's right fist as standards for the normal size of his heart. Two measurements are taken—(*a*) from the ulnar side of the metacarpo-phalangeal joint of the little finger to the dorsal surface of the interphalangeal joint of the thumb, and (*b*) the sum of the hand's-breadth and the length of the first phalanx of the middle finger. The length of the normal heart, according to Levy-Dorn and Möller, is on an average 1 cm. less than the figure obtained by either of these two measurements.

But even when allowance has been made for sex, age, and weight, the measurements of the healthy heart may differ considerably, and, moreover, the distance of the apex and left border from the mesial plane varies according to the phase of respiration in which the record was obtained, and consequently we do not feel justified in regarding a heart as enlarged merely because it exceeds by a few millimetres the average for sex, age, and weight.

The Form of the Heart in Pathological Conditions.—Morbid affections of the heart are more readily detected by alteration of form than by variations in size alone. Not only do one or more of the curves forming the cardiac silhouette often present departures from the normal, but each cardiac lesion is as a rule associated with more or less characteristic changes in the outline, some of which we now proceed to consider.

Mitral Incompetence.—In slight cases, with only lesser signs of cardiac enfeeblement and with compensation fairly well established, we find that the cardiac outline does not present any marked abnormality, except perhaps a slight increase in the prominence of the left auricular or pulmonary curves. If compensation is less fully established these curves become more pronounced. In cases presenting signs of obvious cardiac failure we find a more or less general enlargement of the heart's outline, the left ventricular curve being increased and passing upwards into an unduly prominent curve, which it may be impossible to identify as auricular or pulmonary, except by the character and time of its pulsation. The right auricular curve in cases of simple mitral incompetence

is not usually markedly excessive. In our cases of pure mitral incompetence the largest heart was that of a man, aged 50, presenting no cyanosis or œdema, in whom the measurements were L.D. 10.7, M.R. 6.7, M.L. 11.6, and T.D. 18.3 cm. When the tricuspid valve becomes incompetent as well as the mitral we

FIG. 4.—MALE, AGED 50, MITRAL STENOSIS, WITH PHYSIOLOGICAL RHYTHM

find the heart enlarged in all its diameters. Thus in a man aged 34 the measurements were L.D. 18.0, M.R. 5.5, M.L. 12.0, and T.D. 17.5 cm. In these cases the right auricular curve often bulges

FIG. 5.—FEMALE, AGED 32, MITRAL STENOSIS, WITH PHYSIOLOGICAL RHYTHM

The pulmonary curve is particularly prominent.

outwards very considerably; but in many instances the precise outline of the heart is difficult to determine because of pulmonary œdema.

Mitral Stenosis.—The orthodiagraphic picture of mitral stenosis varies not only according to the degree of associated mitral incompetence, but more markedly according as to whether the auricular musculature is contracting in a co-ordinate fashion or is in fibrilla-

tion. In mitral stenosis, if the auricles are contracting at their proper time in the cardiac cycle, a presystolic murmur is usually audible, and the pulse is either rhythmic or at least not wholly arrhythmic. In such cases the orthodiagraphic picture often reveals a somewhat vertical heart (Figs. 4, 5), in which the striking feature is the particularly clear demarcation of the curves from one another. At the same time we observe that the right auricular, the left auricular, and the pulmonary curves are enlarged, especially the latter, and that in some instances the curve of the left ventricle is small (Fig. 4). Orthodiagrams demonstrate more clearly than is possible by percussion that the relative size and distension of the cardiac chambers *intra vitam* are closely comparable to those found at post-mortem examination. We have also been able to gauge the progress of some of our cases, and to determine the efficacy of treatment, by comparing orthodiagrams taken at intervals during the patients' stay in hospital. Unless the changes in form and size of the heart's outline are well marked, however, we must be cautious in drawing hasty conclusions from orthodiagrams, because an apparent diminution in the size of the heart may be due, at least in part, to the record having been obtained in a different phase of respiration than when the earlier record was taken.

Auricular Fibrillation.—Cases of auricular fibrillation, with or without mitral stenosis, present a large globular heart in nearly every instance of our series (Figs. 6 and 7). In ten consecutive cases the following measurements were recorded :—

Sex	Age	M.R.	M.L.	T.D.	L.D.
Male	21	4.5	12.0	16.0	18.0 cm.
,,	24	6.2	10.4	16.6	18.5 ,,
,,	27	5.2	9.6	14.8	15.8 ,,
,,	31	5.0	9.0	14.0	15.0 ,,
,,	40	6.7	12.3	19.0	19.5 ,,
,,	45	4.5	10.2	14.7	14.0 ,,
Female	25	6.8	7.3	14.1	14.0 ,,
,,	34	6.7	10.1	16.8	18.9 ,,
,,	40	8.4	8.5	10.9	17.5 ,,
,,	45	4.0	7.9	11.9	13.2 ,,
	Average	5.8	9.7	15.4	16.4 ,,

The right auricular curve is lengthened and projects pro-

minently to the right. The left margin is displaced outwards. The curves of the left auricle and the pulmonary artery are either

FIG. 6.—FEMALE, AGED 25, MITRAL STENOSIS, WITH AURICULAR FIBRILLATION.

A large globular heart.

- - - - - - The deep percussion dulness of the heart.

× × × × × × The superficial percussion dulness.

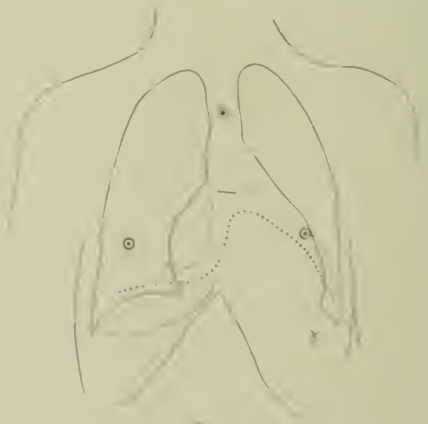

FIG. 7.—MALE, AGED 21, AURICULAR FIBRILLATION.

Record taken during tranquil respiration.

. . . . The deep percussion dulness.

The superficial percussion dulness in full expiration.

— . — . — The superficial percussion dulness in full inspiration.

markedly prominent, bulging outwards and upwards towards the left axilla, or, if the dilatation of the left auricle and right ventricle be still more excessive, these curves become fused with each other and with that of the left ventricle. In auricular fibrillation the

globular form of the heart is most pronounced in those patients who present such signs of cardiac failure as dyspnœa and cyanosis, yet the globular heart may be observed in cases with relatively trivial cardiac symptoms. In exceptional instances patients who present auricular fibrillation, but who are able to be up and to go about the ward, do not show the globular form of heart, and in them the pulmonary and right and left auricular curves are only moderately enlarged.

Aortic Incompetence.—In cases of simple aortic incompetence the heart is usually but not constantly enlarged. In some cases we found that the form of the cardiac outline did not differ very materially from the normal; in others the long axis of the heart was even more vertical than normal; but in grave cases the "recumbent egg-form" described by Groedel may be seen. In eight cases the following measurements were recorded :—

Sex	Age	M.R.	M.L.	T.D.	L.D.
Male	23	4.7	7.5	12.2	14.4 cm.
,,	38	4.8	7.8	12.6	15.7 ,,
,,	38	5.0	8.0	13.0	16.0 ,,
,,	41	5.0	9.2	14.2	14.5 ,,
,,	49	5.1	11.4	16.5	18.9 ,,
,,	51	5.6	12.5	18.1	17.8 ,,
,,	58	5.0	10.3	15.3	16.5 ,,
,,	68	4.1	8.7	12.8	14.0 ,,
	Average	4.9	9.4	14.3	15.9 ,,

When we compare these measurements with those from cases with auricular fibrillation, it is found that the average measurements in uncomplicated aortic incompetence are less than those in auricular fibrillation.

Although the form of the cardiac outline is not uniformly identical in all cases of aortic incompetence, those that are shown in Figs. 8 and 9 are probably the most characteristic. In both these figures the long axis of the heart is more horizontal than in health, and the long diameter is excessive owing to dilatation and hypertrophy of the left ventricle. The pulmonary and auricular curves are not excessively prominent, indicating that neither the right ventricle nor the auricles are unduly distended. The right upper curve, however, is unduly prominent, and may exhibit excessive pulsatile movement, indicating dilatation of the ascend-

ing portion of the aortic arch. The uppermost (aortic) curve on the left side is also excessive and pulsates freely. In other instances, when the dilatation of the aortic arch is associated with

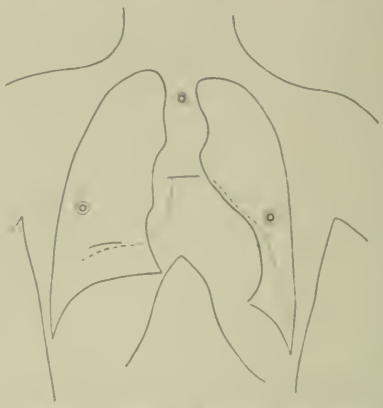

FIG. 8.—MALE, AGED 23, AORTIC INCOMPETENCE.
..... The deep dulness.

dilatation of the thoracic aorta, or with undue distension of the conus arteriosus, the cardiac shadow at the level of the third chondro-sternal articulation becomes more diffusely broadened.

FIG. 9.—MALE, AGED 58, AORTIC INCOMPETENCE.
V, The position of the apex beat. Z1, Upper margin of shadow of liver in full expiration.

In cases such as these it is especially desirable to examine the patient in oblique positions, and particularly in that with the patient turned 45° to the right, in order to exclude the presence of an aneurysm of the aorta. In many cases of aortic incom-

petence the aortic shadow is found to be unduly dense owing to pathological thickening of the wall of the aorta.

Aortic and Mitral Incompetence.—In these cases the curve of the left ventricle becomes further enlarged, while the curves of the right and left auricles and of the pulmonary artery become more prominent than in cases of pure aortic incompetence. In advanced cases the heart's outline becomes still more globular, and all the diameters are increased (Fig. 10). The average diameters of four cases were M.R. 6.1, M.L. 11.4, T.D. 17.5, and L.D. 18.5.

In many cases presenting cardiac symptoms, but without any recognisable evidence of valvular lesion, an orthodiagram may be

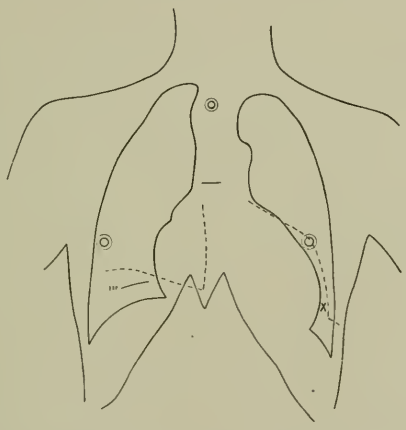

FIG. 10.—MALE, AGED 61, AORTIC AND MITRAL INCOMPETENCE.
X, The position of the apex-beat.
- - - - - - The deep percussion dulness.

of considerable interest and value. In cases of chronic interstitial myocarditis and of arterial sclerosis, for example, the orthodiagram may reveal enlargement of the left ventricle which was not sufficiently pronounced to be recognisable by palpation or percussion. In cases giving a history of palpitation, tachycardia, or angina, the determination that the heart's outline is wholly normal, or that there is obvious enlargement of the ventricular, pulmonary, or auricular curves, is of great assistance in forming a definite opinion as to the cause of the patient's trouble and as to the prognosis of the case. The size, form, and pulsations of the aortic curve should be studied with particular care in cases of angina pectoris in comparatively young persons. In some of these cases the aorta will be found to be perfectly healthy; in others the

aorta bulges too prominently either on the right or the left side, and at the same time the aortic shadow may be unusually dense owing to thickening and calcification of the aortic wall, and the pulsations of the aorta may be of excessive amplitude. In patients who are convalescing from pneumonia, and in whom enfeeblement of the right heart may be suspected, the orthodiagraphic record may demonstrate a pronounced bulging of the pulmonary curve in the absence of any abnormality of the auricular curves. In two of our cases convalescing from acute pericarditis the right auriculo-hepatic angle in the orthodiagram was obtuse.

Some of the irregularities of the heart's action can be observed readily on the orthodiagraph screen. Ventricular extrasystoles are best seen at the apex of the left ventricle. As a rule, the auricular pulsations are not sufficiently well seen on the screen to enable one to determine by this means alone whether the auricles are beating rhythmically or not ; but in a recent case of complete heart-block we could see very clearly that the right auricle was beating rhythmically about eighty times per minute, whereas the rhythmic pulsations of the left ventricle and the aorta were at the rate of only thirty-three per minute.

In the diagnosis of aortic aneurysm the orthodiagraph enables us to define the exact site and size of the aneurysm in a manner that is seldom possible by means of palpation and percussion (Fig. 12). We have found the orthodiagraph of especial assistance in cases of deep-seated aneurysm of the thoracic aorta (Fig. 11).

During the past year we have compared the percussion outlines of the heart with the orthodiagraphic outline in many of our cases, and we find that percussion has usually failed to afford us accurate indications of the size of the heart. We find that the left border of the heart and the upper limit of the liver, as ascertained by a firm percussion stroke, are usually placed too far to the left and too high respectively. The error is often slight and trivial in the case of the normal heart, but when the heart is much enlarged the percussion outline is often quite erroneous. What the late Sir William Gairdner called a carefully minimised percussion stroke is, in our opinion, better than a firm stroke for the delimitation of an organ such as the heart. But even by means of the most carefully adjusted percussion stroke, the precise form and size of the heart cannot be determined as accurately as by means of the orthodiagraph. We have to remember that the heart lies obliquely in the thorax, the base lying further back than the apex, and con-

sequently the determination, by means of percussion, of the upper or basal part of the heart, including the left auricle and conus arteriosus, must necessarily offer special difficulty. Further, we find that the enlarged heart is as a rule more difficult to percuss

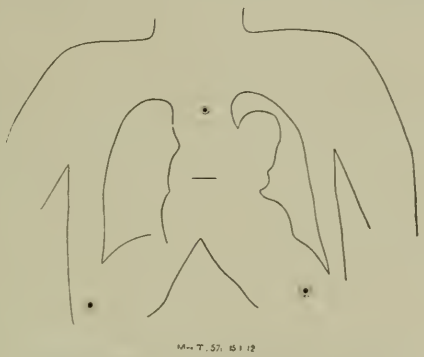

FIG. 11.—ANEURYSM OF DESCENDING THORACIC AORTA.

out accurately than the normal heart ; that the right border as ascertained by percussion is more often erroneously demarcated than the left ; and that except in cases of pericardial effusion the

FIG. 12.—MALE, AGED 68, ANEURYSM OF THORACIC AORTA.

left percussion border is almost certainly inexact if it lies well outside a clearly defined apex-beat. The latter is often the best guide we have regarding the size and degree of enlargement of the left ventricle.

In conclusion, we desire to express our sincere thanks to the

trustees of the Clinical Medicine Research Laboratory of the Royal Infirmary of Edinburgh for much kind advice and assistance in the course of our work in the laboratory, and to our colleague, Mr Mr Archibald M'Kendrick, to whom we are indebted for the drawing reproduced in Fig. 1.

Discussion

The President said the Society would be glad to hear any remarks on this subject, which perhaps did not lend itself very much to discussion; but at least they could thank Dr Ritchie most sincerely for his very interesting paper, which must have entailed a great deal of work.

Dr William Russell did not doubt that Dr Ritchie's observations were correct, but if the contention based on these observations is to stand without challenge they would each have to stock an instrument of this description, not only all of them who were hospital physicians, but all who engaged in general practice. That, of course, was a somewhat hopeless attitude to take up. While one accepts all these observations as undoubtedly correct—Dr Ritchie was too careful an observer and much too conscientious a worker to bring before the Society observations which are not perfectly correct—one was surprised at Dr Ritchie taking up the position that this could not be done without this machine. He was prepared to demonstrate to Dr Ritchie that he could percuss out the whole heart as accurately as it was portrayed here. He had done it for thirty years and had written on the subject twenty-five years ago and showed that it could be done, checking and re-checking his observations in the post-mortem room. He was glad to find that Dr Ritchie's observations so entirely homologate the views which he had long been trying to impress upon students and others, namely, that one can absolutely determine the right border of the heart, not as Dr Ritchie percusses it, but in the middle of the sternum—half to one inch to the right of the sternum is its anatomical position. Many physicians had difficulty in determining it because they did not realise what the difference in the percussion is. The right border of the lung becomes thin as soon as the right auricle gets behind it, and one is percussing out this thin portion of lung. That means that one is at the margin of the right auricle and that one can with perfect ease not only determine the heart but the position of the superior cava. One can make

out by means of percussion an absolutely correct anatomical picture, and it matters not whether the heart is small or large.

Dr Rainy expressed his admiration of the work which Dr Ritchie had done since his appointment as Superintendent of the Laboratory; it said a great deal that in such a short time he had been able to bring forward so many cases.

The orthodiagraph gave a very good silhouette. One puts the patient in the normal position and one gets with a straight line all round an exact outline from back to front. In percussing one is working round a curve. Again, a percussion stroke does not project itself as a line into the tissues, it is a stroke and goes in circles just as a stone makes a circle as it drops into water; that had a great deal to do with the difficulty of percussing the right border of the heart. If he was to offer any criticism he would say he thought Dr Ritchie was not really percussing hard enough; it is a matter of clinical experience.

Dr Russell has trained himself by comparing carefully percussion outlines in the post-mortem room; that was why his percussion of the heart approximates much more closely than those which had been thrown on the screen.

Dr Ritchie, in reply, said that Dr Russell, by following out his percussion outlines in the post-mortem room, had attained a great deal of accuracy, but he was still of opinion that the method of percussion described in his paper was the more accurate.

Dr Ritchie then went on to speak of Sir William Gairdner's remarks as to the percussion methods in Edinburgh and Glasgow, the former of which he condemned most strongly.

Dr Rainy had raised the question of too light percussion; as a matter of fact until he (the speaker) had taken up the subject recently, he was in the habit of percussing far too heavily. He was then using the method which he had followed for fifteen years, and which he had been taught as a student.

References.—[1] *Die Röntgendiagnostik der Herz- und Gefässerkrankungen*, Berlin, 1912. [2] *Amer. Journ. Med. Sci.*, 1909, cxxxviii., 549; 1910, cxl., 506. [3] *Zeitschr. f. klin. Med.*, 1911, lxxii., 563.

Meeting VI.—February 28, 1912

Mr J. M. Cotterill, *President, in the Chair*

I. Original Communication

THE TREATMENT OF SIMPLE FRACTURES

By Charles W. Cathcart, F.R.C.S., Surgeon to the Royal Infirmary

In trying to shape a short paper for the purpose of opening a discussion upon the treatment of simple fractures I have omitted any minute description of the methods to which I shall refer. What we are mostly concerned with to-night are the results of certain methods and their relative value as compared with one another.

For some years after the introduction of antiseptic methods into the practice of surgery the energies of surgeons were expended with such vigour in developing certain new fields of work that other and older fields were allowed to lie fallow. Thus during the period when immense progress was being made in the surgical treatment of diseases of the alimentary canal and nervous system the treatment of simple fractures remained without much change. The subject, however, did not, and never will, lose its interest, for fractured bones are of frequent occurrence, and the consequences often influence the whole of the patient's future life, as is well known.

In later years a stimulus to the search for improved methods of treating simple fractures has been supplied by the Workman's Compensation Act, in the careful inquiry which this entails, or should entail, into the after results in fractured bones. Apart from legal obligations the economics of the question must attract our attention—every man unfitted for his work by a broken bone is a loss to the State, and any method which will send men with broken legs back to their work even a few weeks earlier than other methods will save many thousands of pounds per annum.

From a scientific point of view several factors have contributed in recent years to recall the attention of the profession to the healing of fractures. The revival of massage, the careful study of its effects and mode of action, and its remarkable success in the treatment of sprains and bruises has been one, the revelations of the X-rays has been another, and not least has been the antiseptic method itself. By the impunity with which it permits of

the direct inspection and manipulation of the broken bone it has gradually enlarged the knowledge of the pathology of recent fractures, explained the reasons for the occasional failure of non-operative methods, and opened up a line of treatment peculiar to itself.

At the present time, therefore, the attention of the profession is once more drawn to fractured bones. A committee of the British Medical Association is at present engaged in reporting on the results obtained after fracture of the long bones in many of the chief industrial centres of the country, and our discussion to-night is another indication of the same spirit of inquiry. For the treatment of a recent case of simple fracture, say of the leg, there are three methods available, *i.e.* the old immobilisation method, the massage and early movement method of Lucas Championnière, and the immediate operation method advocated by Arbuthnot Lane. My object to-night is to draw out opinion as to the relative merits of these three, so that the general practitioner into whose hands simple fractures first fall may be guided as to which he should employ, or call in others to employ, in any particular case.

1. The old *immobilisation method* consisted in setting the broken bones and fixing firmly with splints not only the seat of fracture but also the joint above and the joint or joints below the broken bone. This immobilisation was kept up until the bone was united. This required a period varying from 3 to 6 or 8 weeks. After that in many cases the limb was enclosed in plaster of Paris for several weeks to allow the union to solidify. On removal of the plaster the patient was told to use the limb. However, great difficulty was generally found in doing so, and a long and tedious convalescence had to be faced to restore more or less completely the functions of the joints and muscles.

The guiding theory in this method was that bony union could not take place if there was the slightest movement at the seat of fracture during the healing process. The theory, however, is now known to be erroneous. Broken ribs heal readily in spite of the movements of respiration, and the success of the massage and early movement treatment has removed any lingering doubt on the subject.

The rigid fixation impedes circulation and so delays union of the bones, while it permits of adhesions to form in and around joints, also between muscles and around nerves. Once these

adhesions have formed it is generally difficult and often quite impossible to get rid of them.

2. The *massage and early movement method* introduced by Professor Lucas Championnière. In this method splints are used only to a limited extent, and their object is to prevent displacement, *i.e.* to obviate mal-union, not non-union. They are not, however, discarded altogether, as some suppose. Massage is employed as soon as possible after the fracture, and is continued daily at first and afterwards at longer intervals. The object at first is to relieve muscular spasm and disperse effusion, afterwards to promote absorption of effused blood and lymph and maintain the nutrition of muscles. Combined with massage, movements of the adjacent joints, both active and passive, are cautiously employed to prevent formation of adhesions in tendon-sheaths and joints, and to maintain the nutrition of the muscles.

The theoretical basis of this treatment is that rapid healing of the broken bone is promoted by the free circulation which is encouraged, while adhesions are prevented and the nutrition of the muscles maintained. Prevention is better than cure. Exact apposition of the broken ends of the bone is considered in most cases to be of less importance for future usefulness of the limb than free use of the joints and muscles. This had been proved to be true by experience in many forms of fracture. The bones heal much more rapidly than was believed to be possible under the older treatment, and the muscles and joints are ready to resume their function when the bones are firm. The objections raised against this method are that it requires more time and attention than the immobilisation method, and that it does not give good results in every case. What these cases are we propose to consider to-night, but in the suitable cases the results amply justify the trouble taken. The principles involved can be grasped, and the manipulations required can be learned, by any medical man, and he can have the treatment carried out in most cases by some sensible friend or relation of the patient, under his direction. Professional masseurs do not generally treat fractures well, and in any case they require special instruction. They are not sufficiently cautious and gentle, but in mining or other industrial centres it ought to be quite possible to have persons available who have been taught to carry out the treatment properly and to act under the local doctor's instructions.

3. The *immediate operation method*. This is recommended by

its advocates in most fractures of long bones in children and adults, especially of the lower limb, and in probably the majority of fractures involving joints. Under a rigid aseptic technique the ends of the bone are exposed, blood clot removed, and the broken fragments adjusted and held in exact position by steel plates fixed into the bone with screw nails.

The theory underlying this treatment is that in the lower limb especially, restoration of function demands mechanical restitution of the shape of the bone, that without this restitution union is delayed, and that pain is necessarily caused when the limb is used by the altered strains in the bone resulting from the change in its shape.

It may be granted that exact reposition of the broken ends will hasten reunion, but no account is taken of the additional laceration of the soft parts involved by the operation nor of the delay in obtaining functional restoration owing to disuse of the muscles and joints during the healing of the wound. Again, the marvellous adjusting power shown in the process of repair in response to functional demands is underestimated by the advocates of the immediate operation. This is especially true in the case of fractures in children, and I shall allude to it again when speaking of fractures of the shaft of the femur.

There are two additional points which should also be remembered—one is that the argument for operation is based largely upon the bad results obtained from the old immobilisation method, where the pain of the limb and stiffness of the joints is in most cases due not so much to imperfect restitution of the form of the bone as to adhesions and other changes in the soft parts traceable to the prolonged fixation; the other is that the X-ray photographs taken of fractures before they were plated do not apparently always represent the best position attainable without operation. This leads to a false impression of the mal-position that would have followed non-operative treatment.

The operations on recent fractures require much surgical skill and a thoroughly reliable technique, otherwise bad functional results, amputations, or even deaths are liable to result. This, of course, does not affect the merits of the method in competent hands, but it does make us desire to find a method which is more widely applicable with safety and yet gives satisfactory functional results. Such I believe to be furnished by Lucas Championnière's massage and movement treatment.

The three methods to which I have referred vary in simplicity and ease of application in the order in which they have been placed, and it is important that we should recognise the extent to which the simpler methods may be employed with satisfactory results.

I venture to suggest the following :—

1. The rigid immobilisation method may now be modified since the massage and movement method has taught us that some movement is no obstacle, but rather a help, towards union. We seldom need to secure the joint above and the joint below the seat of fracture unless for the patient's comfort, and the limb may be massaged and the joints moved as often as convenient.

This modified immobilisation method will give good functional results in children in most fractures of the shafts and in adults in the same kinds of fracture (shaft of femur excepted) where there is no great displacement of the fragments nor severe laceration of soft parts. In fractures of the femur in adults, however, prolonged fixation is apt to lead to trouble in the knee, as will be afterwards explained.

2. Massage and early movement, in accordance with Lucas Championnière's directions, gives more rapid results than the modified immobilisation method does in the classes of case to which I have just referred, although the final results may not be much better. It is also the method of choice for fractures near or involving joints, such as fractures of the olecranon, and many fractures involving the elbow in children, so long as they do not require immediate operation (see paragraph 3), and in fractures of shafts with much laceration of soft parts and irregularity at the seat of fracture, so long as there is not much angular or axial deformity nor necessity for complete restoration of length of limb as it is in the lower limb of men in the public services. It is also to be preferred to the modified immobilisation method in fractures suitable for operation where operation is contra-indicated owing to the patient's age or constitution, to local sepsis, or to other sufficient cause.

3. Immediate operation where reliable technique is available is the method of choice in transverse fracture of the patella in healthy adults, in joint-fractures where the fragments mechanically hinder movement, in cases where the important muscular attachments are torn off and cannot be approximated, where a nerve is involved or soft parts prevent the fragments from coming into contact, or

where angular and axial deformity cannot be restored by manipulation or posture, especially in the lower limb, or again where the patient's occupation necessitates walking without a limp, as it does in the army or police force.

In cases such as these adequate operative treatment should be obtained. Sometimes the swelling after an injury makes it difficult to diagnose the exact seat of the fracture and the position of the fragments. In doubtful cases an X-ray photograph should be taken as early as possible; failing this a careful examination under chloroform is advisable with accurate comparison of the injured and sound limb by measurement, after the best possible restitution.

These general principles will, I think, be sufficient as a guide, and will cover most of the cases. We have no time to take up the treatment of many individual fractures, but it will be useful if I refer to three common forms of fracture, into the discussion of which many of the general principles enter.

1. *Colles's Fracture.*—Reduction in this fracture seems to me advisable not only to minimise as much as possible an unpleasing deformity in an exposed part, but also to re-establish the range of movement at the wrist as fully as possible. When the articular surface of the radius remains after the fracture looking slightly backwards instead of slightly forwards, as it normally does, the wrist in virtue of this alteration acquires an increased range of dorsiflexion and loses some of its range of antiflexion, quite apart from any question of adhesions. A general anæsthetic should be given in most cases. The hand should be extended in the dorsiflexed position and gradually brought forward, while the back of the lower fragment is pressed down and forward by the operator's thumb.

A splint is provided for the anterior surface, either Carr's anterior splint or a wooden splint with a pad to fill the palm of the hand, and the hand and fore-arm are lightly bandaged to it. A portion splint is optional. Warm fomentations and gentle massage give relief to pain which is severe at first. Massage to the wrist and fore-arm applied at the first sitting is repeated daily, the criterion of correct massage being that muscles are soothed, swelling rapidly reduced, and yet no pain caused. Passive movements following the massage are confined at first to the fingers and carried to the wrist as pain subsides. Active movements of the fingers begin about the third day. The splint is discarded

in 10-14 days, and the hand removed from its sling in about 3 weeks.

The chief cause of disability after Colles's fracture is the presence of adhesions in the posterior tendon sheaths and in the wrist joint, and these evils very seldom appear when the massage and movement treatment is properly carried out. When they do show themselves in spite of massage and movement they are most frequently the result of an onset of osteo-arthritis settling down on the injured part. The support to the fore-arm and wrist are given primarily for comfort and ease, and secondarily to diminish the return of deformity which would be apt to result from spasms of the muscles if the injured part were not supported.

This is a fracture where operation is seldom if ever called for, but where immobilisation is likely to do much harm. It is one in which the massage and movement treatment has given excellent results, and restored to usefulness hands which by the older method would have become permanently stiff.

2. *Pott's fracture* varies much in severity. In most cases it is possible to restore the position of the foot either at once with or without an anæsthetic or within a few days, as the spasm of the muscle subsides under massage.

The deformity which is most apt to be overlooked is that of backward displacement of the foot. This if not remedied will curtail dorsiflexion at the ankle and leave a permanent limp in walking.

The eversion of the foot is more easy to recognise, but if allowed to remain is a source of disability in walking. A strain is put on the ligaments and tendons at the ankle when the patient's weight is borne upon the limb, and this besides causing pain excites a chronic inflammation in the neighbourhood which in turn increases stiffness.

While therefore massage and movement is the method of choice for this fracture an operation may occasionally be called for. Prolonged fixation is apt to lead to stiffness of the ankle.

I generally use a box splint, but when eversion is troublesome Dupuytren's splint is the best, and every now and then Syme's stirrup splint is required to prevent recurrence of backward displacement of the foot.

3. *Fracture of the Shaft of the Femur.*—This is a common injury both in children and adults, but the difference in the results of a similar fracture at these two periods of life is most striking.

In children during the period of growth, I do not remember any case where a shaft fracture did not mend with perfect recovery of function. In a recent examination of cases of fracture in the Royal Infirmary 16 cases of fractured femur were presented for examination, all treated without operation by different surgeons and by many different methods. The children's ages when injured had varied from 11 months to 13 years. The results were excellent without an exception.

I prefer the treatment by extension and local splints after reduction under chloroform, combined with massage and early movement—Lucas Championnière's method. Various modifications are permissible, but of this I am satisfied, that operation and plating for a simple fracture of the shaft of the femur in a child is quite unnecessary.

In adults the case is different. The muscles surrounding the bone are massive and powerful, and they swell rapidly from infiltration with blood and serum. Through this thick covering no one can determine the form of the fracture or accurately adjust the ends into alignment even under the deepest anæsthesia, consequently I believe that the accuracy or not of alignment in different cases depends less on the surgeon's skill than on the nature of the fracture. If the fracture is transverse the broken ends will override and be separated by the thickness of the shaft; if the break is oblique the ends although still overriding will lie more nearly in line. In either case some shortening in spite of heavy extension seems inevitable, hence the statement which I made earlier in the paper that some shortening is almost inevitable in fracture of the shaft in an adult.

On the other hand, except in rare cases in which there is interposition of soft parts we may expect bony union, and, given time, the union will become strong enough to bear not only the man's weight but heavy loads besides. The popular belief that the seat of fracture becomes stronger than the original bone seems to be correct, perhaps even more so in cases where there is deformity than where there is none. The strain is a stimulus to the consolidation of the callus which is affected by it, but let us not forget that the greater the strain owing to altered shape of the bone the longer the delay in solidification, and of course also the more the overriding and angling the greater the amount of shortening and limp.

Besides the causes of disability traceable to altered mechanical

conditions in the united bone there are others associated with the muscles; one is the involvement of the quadriceps in the callus —this limits flexion of the knee—the other is atrophy of the muscles, especially the quadriceps, from disuse. The resulting weakness prevents the patient from bearing his weight on the injured limb, and the real cause of the disability often escapes observation, being attributed to the bone instead of to the muscle.

These muscular changes will improve under massage and exercise, and in many cases disappear unless where immobilisation has been continued too long, but even under Championnière's régime steady perseverance with massage and voluntary effort on the patient's part is required for some time after union has taken place. When the patient refuses to make an effort and shirks treatment, as one often finds in workmen's compensation cases, the disability will drag on indefinitely.

For my own part in fracture of the shaft of the femur in adults I am not prepared to give up the massage and movement treatment in favour of operation as yet, but I am willing to admit that there seems room for improvement. I have had no opportunity of judging of operative results. In some of my unsatisfactory cases some bending at the seat of fracture has taken place after the patient left the ward. This is the Scylla, of which the Charybdis is stiffness of joints and atrophy of muscles from too long fixation. As the result of experience, I hope in future to be able to steer more successfully between them.

Time does not permit me to discuss any other forms of fracture, but I look forward with much interest to the discussion which is to follow, and hope that it will enable us to clear up our ideas on this most important subject.

Discussion

Professor Alexis Thomson said that personally he was a disciple of the French surgeon, Lucas Championnière. It was difficult to formulate any parallel regarding the enormous improvement which Championnière's work had brought about on the results of the treatment of fractures. Professor Thomson had been fortunate in succeeding Professor Chiene, from whose wards splints in the treatment of fractures had disappeared for some years previously, and in being associated with Mr Pirie Watson, who had taken a special interest in the treatment of fractures. He confined his remarks to

fractures of the lower extremities. The contrast between the treatment of fracture of the femur when he was a student and its treatment at the present time was marvellous. Then chloroform was administered, the fracture reduced, a short local splint applied, extension applied to the limb, and finally the long splint was applied and the patient lay in bed for from six to ten weeks while the fracture united; there was great discomfort to the patient lying in the long splint, and complete loss of function of all the tissues. Nowadays a patient with fracture of the femur may or may not be given chloroform for its reduction, and unless he has some shortening to be corrected by extension he has no other disability. The knee is flexed over a pillow and he is encouraged to use his muscles, with the result that while the fracture is uniting his tissues are kept in good condition. Three or four days after fracture of the shaft of the femur the patient should be encouraged to use his thigh muscles and promote absorption of the extravasated material. If a more difficult fracture has to be dealt with, in which there is pronounced shortening, perhaps beyond what is capable of being overcome by the ordinary extension with weight, he advised the use of an apparatus invented by Steinmann, a specimen of which was shown. It was placed on either side of the limb and fixed to a pin inserted into the lower end of the femur. By this means extension equal to 40 or 50 pounds was obtained, and any shortening could be undone; in fact one had to be careful not to make the leg longer than its fellow. The most difficult thing to correct is the eversion, and undoubtedly for this purpose the long splint was useful; sandbags on either side of the limb were also useful. Under modern methods eversion is most difficult to correct in fractures of the shaft and neck of the femur. In using Steinmann's apparatus in fracture of the neck of the femur one must be sure that the pin is introduced through the trochanter in such a way that it will ultimately arrive at the side of the bone. Sometimes two pins may be necessary.

While one of his patients was lying in bed with two pins through the trochanter she was encouraged to turn the limb in certain directions, and the masseuse kept the leg in better condition. It is more difficult below the lesser trochanter. If rest is combined with the splint apparatus and the limb is allowed to lie over a pillow massage will keep the condition of the limb right in other respects. On looking into the results of his cases this winter he found one fracture of the thigh up and walking about in six weeks; by the older

methods that result could not have been achieved. In fracture of the femur, with a sandbag lying on either side, if the patient is asked to lift the leg the bending can be seen as he lifts it. Some years ago it would have been considered criminal to lift the leg off the bed, whereas now we know it was beneficial In another case an old woman over 80 was walking well in six weeks, in the case of a man with fracture of the neck of the femur he was up on the 21st day and out on the 28th.

Mr David Wallace was of opinion that the introduction of X-rays had given a great impetus to the consideration of fractures. Genito-urinary surgery entered on a new epoch when the cystoscope was introduced, and the treatment of fractures had entered on a new epoch when the X-rays were introduced. He thought it a duty in every case of fracture to use the X-rays, not only for the purpose of definitely determining where the displacement is, but even after the setting of the fracture had been carried out, in order to see whether that has been properly done. In the case of the upper extremity not infrequently the screen was sufficient.

Mr Cathcart had alluded to three methods, and under certain conditions each of these has a merit of its own, and in individual fractures any one of them may be the proper one to adopt. He had been for many years a strong believer in Lucas Championnière's method, all the more so perhaps because, like Mr Thomson, he was associated with Professor Chiene, who laid great stress upon its value, and it was interesting to remember that Professor Chiene in his teaching pointed out how important movement and massage were in a fracture near a joint, and how he recognised that union took place quite satisfactorily in spite of the movement and massage carried out. In Colles's fracture more particularly good results are obtained; in Pott's fracture, however, they did not carry out that treatment until Championnière showed it was the right thing to do. Displacement is due to one of two things, namely, to the violence producing the fracture or to muscular action. On this depends greatly the treatment suitable for individual cases. In the former circumstance once the fracture is set there is no reason for any further displacement occurring; this is so both in Colles's fracture and in Pott's fracture, and in these cases, as Mr Cathcart has said, a splint or some form of support may be beneficial for a day or two after the accident to give comfort to the patient, but is not required

to prevent displacement. Mr Wallace used practically no splints in his wards. In Pott's fracture he kept the leg at rest, he never used sandbags; in Colles's fracture he put the arm in a sling and encouraged the patient to make movements. In fracture of the femur it was most important to have good alignment of the bone; as Arbuthnot Lane and Robert Jones pointed out, if the alignment is unsatisfactory then the weight of the body is borne in such a way that it gives rise to much pain. If good alignment cannot be obtained without operation then he thought operation was the right thing. During the past year he had had three cases of fracture of the femur; two of them were transverse fractures about the middle third, and in neither could he get the fragments in apposition, he therefore cut down and plated them. These two cases were extremely satisfactory, while the third case was at present under treatment.

He asked what Mr Cathcart's procedure was in fracture of the clavicle. Personally he thought it was more difficult here to get a good result without shortening than in any bone in the body; also he would like to know what his results are in operation for fracture at the elbow-joint. He mentioned the matter because he (Mr Wallace) had had two cases in which the results were not good. He operated on one of the cases twenty-four hours after the accident, but it was not satisfactory on account of a chronic rheumatic arthritic condition developing immediately after the operation. The wound healed by first intention. In the other case the condition was present at the time of the operation, and although half of the head of the radius which had been displaced was removed the arthritic condition persisted, and the elbow did not make a satisfactory recovery.

Mr Scot Skirving referred to the method of reduction of Colles's fracture as practised by Robert Jones of Liverpool, and demonstrated the procedure. For fracture of the femur the caliper splint —a modification of Thomas's knee splint—was a great advance on the long splint and extension.

Personally he operated more frequently now than formerly, but never on any fracture in which there is no displacement. He agreed that in fracture of the femur where there is much displacement better results were obtained by operation than by the old method where one has been unable to get the ends in exact opposition. Mr Skriving thought there was a great tendency to displace-

ment in Pott's fracture. It has to be carefully watched; the great risk was the development of traumatic flat foot.

Mr Wade said that during the past three years he had had exceptional experience in the treatment of simple fractures. In the Out-Patient Department of the Royal Infirmary treatment by massage and movement had been carried out for some time before that. He gave the following account of the procedure carried out and the results obtained:—A fracture arrives and is examined by the house-surgeon, some temporary treatment is employed, and the patient told to return the following day. When he returns a careful examination is made and a record of the case taken; an X-ray photograph is taken, which is ready the next day; the passive treatment is carried out, and the patient handed over to the massage department. They quite exceptionally used splints. The rule is for the massage to commence at once and for passive movements to be carried out from the first, and, even in the most severe cases, active treatment within the first week. By means of the X-rays they had discovered that in a large number of case where there has been injury to the limb fracture is present where formerly no fracture would have been suspected. So much so is this the case that in the ordinary individual who comes to a medical man twenty-four hours after the receipt of an injury, and who has a complete functional disability of the part with local tenderness over the bone, although there is no deformity and no crepitus, there is a fracture of the bone; he would estimate that in 99 cases out of 100 there is fracture of the bone. The best and most expeditious results were obtained by the massage and movement method; by this treatment 90 patients out of 100 recovered.

Mr Cathcart referred to a selected group of cases in which he would employ operation, and mentioned the case where a muscular attachment is torn off. They had had 7 or 8 such cases in the Out-Patient Department, one where the olecranon process was separated fairly widely from the shaft of the bone. At first they were doubtful about trying massage and movement. The method followed, however, was to set the part; the arm was kept in a sling and massage and movement adopted, the part being steadied and held down while the movements were practised. He doubted whether any other treatment gave such good results—within three weeks union took place. In a number of cases they had the massage done by the patient's wife; they had been able to instruct her in

a very short time, and she was able to carry out the treatment quite satisfactorily.

Mr Scott Carmichael said that during the last two years in the Out-Patient Department of the Infirmary they had seen 1200 to 1300 cases of fracture, more especially of the upper extremity. The basis of treatment was massage and movement. Splints in the treatment of fractures were occasionally necessary, and should be looked upon as a rare accessory. He agreed that this treatment was undoubtedly a great advance on the old method by splints, but there were one or two disadvantages. He was convinced that it required a good deal more supervision and a great deal more care on the part of the surgeon and doctor. There were good masseurs and also bad ones, and striking differences in results were seen according to the intelligence and skill of the masseur or massuese, and one must therefore be sure that the proper massage treatment was used, hence a great deal more supervision was required. Mr Scott Carmichael was convinced that if they were to treat fractures properly and satisfy both the public and the profession there should be a special department for fractures.

Mr Dowden said he had come to the conclusion that the use of these various splints was wrong. In treating a case in private he employed adhesive plaster, placed the arm in a sling, encouraged the patient to make active, not passive, movements, and himself massaged the part. He had done away with splints and bandages, but there was still, unfortunately, shortening which had to be corrected by extension. In one case of fracture of the forearm the patient got perfectly well without splints being employed.

Dr Langwill referred to the after-treatment of fractures. Most of the previous speakers had referred to the treatment of fractures while under the care of the surgeon, but he was more particularly interested from the compensation point of view. He was frequently sent to workmen who had met with an accident who had not been under his care, but under the care of one or other of the surgeons present. He did not see quite the satisfactory results afterwards that the speakers led one to expect. What he found was that after a certain time the patient is discharged from, or leaves, the hospital where he was being treated with the fracture supposed to be cured as regards the original injury, but he is unfit for work. The point

of importance, to his mind, was not merely the union of the bone and a fair amount of movement in the limb, but the patient's ability to earn his livelihood ; until then he ought to remain under the care of the surgeon who originally treated him. The difficulty was that these patients were often living in lodging-houses with nobody in attendance. They nurse their injured limb, going about with it in a sling, and one cannot get them to use it. When a medical man is sent to see the patient on behalf of the employer he finds the man going about ; he is not under the care of any surgeon, it is nobody's interest to see that he is treated. The employers could not insist that their medical men should treat the patient. The patient's statement is that the hospital doctor said he need not come back as the fracture had united. But the limb is not useful, and that man, he thought, ought to be still in attendance. Dr Langwill could not help thinking it would be useful demonstration if surgeons at institutions got their old fracture patients to report themselves two, three, or four months after leaving hospital. They would find a great many of them going about unable for work and drawing compensation.

The important point was when a fracture case should pass out of the cognisance of the surgeon under whose care he was, whether merely after there is good union and the patient is able to walk about with the limb more or less useless or when he is cured, viz., fit for his original work.

Mr George Chiene emphasised the advantages of active over passive movements in the treatment of recent fractures, and said to a certain extent he supported Dr Langwill's contention, but on the other hand those patients whom he saw were looking out for compensation.

He showed two photographs in illustration of the value of wiring fracture of the patella in recent cases. In one case the patient, who died of Bright's disease, was the 7-foot clown in a travelling circus ; the man was at work until shortly before he died. This patella shows four different breaks ; the fragments showed that the fracture was an old one. The other photograph represented a fracture which occurred in a soldier 7 years previous to the time he came under Mr Chiene's observation. He had been invalided from the army seven years before. That man had been doing all sorts of work, and the movement at the knee-joint was perfectly good.

Mr Pirie Watson thought they owed a debt to the operative school for having stimulated an interest in fractures throughout the country. He confined his remarks to the special experience of fractures of the upper extremity which he had had in the Out-Patient Department of the Infirmary. The splint he did not consider important, what really was of consequence was massage and movement at the beginning. The treatment could be carried out with benefit in all fractures except that of the patella, and was applicable by either surgeons or general practitioners, and was specially desirable in older patients. There was great difference between the power of recovery in young and in old joints. The immobilisation method is merely concerned in keeping the bone in anatomical alignment, while the massage and movement method deals with the affection of the soft parts. He emphasised the point that the massage and movement treatment could not be started too early. The massage, at all events, might be started at once. It gives the patient comfort and confidence if rightly employed; it should precede reduction, and for overcoming spasm in the muscles it is useful. Again, massage and movement produce an excellent mental effect on the patient. This treatment was not easy to carry out, it required a great deal of attention, but if it takes more time at first it certainly saves time and vexation later. The masseur, too, is an important factor; he thought the best masseur was the doctor himself. He knows the danger of rough movement, and his training has given him the necessary fineness of touch required to produce good results in massage and movement. As to the criterion of massage, it should never pain but always soothe.

Mr Watson had been able to get perfect alignment in fracture of the clavicle. In one of his cases of fracture of the olecranon the patient was only off work three weeks, and perfect bony union could be seen. He had treated eleven cases of fracture of the humerus without any splints, and the patients were back to work. The last patient was discharged at the end of five weeks, and working as a painter at the end of six. Fracture into the elbow-joint also gave good results by this method, but must be very carefully attended to.

Dr John Orr said that as general practitioners they knew about Championnière's method before, but were not sure about putting it into practice. When he (Dr Orr) was taught surgery the teaching was that the joint above and below should be controlled, and that

the limb should be immobilised; but there were two exceptions—one was Colles's fracture and the other fracture of the elbow-joint. In Colles's fracture early passive movement was carried out; in fracture of the elbow-joint early passive movement was also used, and no splints applied. One would have expected that if the statements with regard to the immobilisation of the joints above and below were absolutely accurate that worse results would have been obtained with regard to movement. His experience was that worse results had not been obtained in Colles's fracture and fracture of the elbow-joint.

Dr James Ritchie said he spoke as a general practitioner, and was afraid he would be considered heterodox, because after a fracture has been reduced his practice was to apply a light splint with an elastic bandage because of the great comfort it gives to the patient. The patient's comfort was a point of great importance. The elastic pressure diminishes the amount of swelling afterwards. He was old enough to see the difference between the old method and the new, and was quite astonished at the difference in time required. It was astonishing how much sooner patients were sent home cured under the new treatment than under the old. Massage ought to be begun the very day of the accident; by so doing the blood and inflammatory material is removed much sooner. On the other hand the new treatment involved a tremendous increase of time and care on the part of the doctor. Patients should be encouraged to carry out all the movements they possibly could, and to do the same every day. His method was to endeavour to produce as much movement as possible in the proper direction until pain is produced; immediately pain is produced stop. Each day one is able to do a little more.

Mr J. W. Struthers said Dr Langwill had complained that the patients passed out of the surgeon's care before they were cured, and Mr Struthers thanked him for introducing a controversial element into the discussion. It seemed to Mr Struthers, however, that the employer was the proper person to treat the patient. After the patient reaches a certain stage the best thing he can do is to work; what he wants is voluntary movement, and the best compulsion which can be brought to bear on him is that of earning his living. The difficulty is that employers will not take these patients back to work. If it were possible to get light jobs for them

they would be fit in a much shorter time than they are at present. Professor Alexis Thomson's remarks on the treatment of fracture of the femur had struck him, for he (Mr Struthers) had great difficulty now and then in obtaining anything like a good result in that condition even in strong men. He had not used Steinmann's apparatus, but with the older methods of treatment he had to confess he had been unable, in a certain number of cases, to get reduction of the deformity without shortening and a good deal of disability. He would like to hear something of the operative results in these cases; probably better results were obtained than by means of "nails," extension, strapping, or wires attached to the femur.

The President said, as a member of the staff of the Infirmary, he would like to remind Dr Langwill that there are two sides to the question he raised. They were all aware, and were ready to admit, that they had to send out not only fractures but a great many other cases from the wards before they would like, but what could be done when there were many urgent cases for operation waiting for the beds? When a patient with Pott's fracture was sent out they knew he was not fit for work, but they were invited to attend the Out-Patient Department, and he thought it would be a great advantage to have a larger staff of rubbers and others to look after these cases. They must be careful as to whether the fracture was recent or old, and not put these patients into the hands of a somewhat enthusiastic and very muscular masseur. He was conscious of cases which have been harmed instead of the contrary by a very enthusiastic masseur; they had to be watched with great care, and particularly so in the treatment of fractures.

The President was very much in agreement with Mr Alexis Thomson when he made an uncomplimentary remark about the long splint. It seemed treason to abuse that method, which was so intimately connected with the Edinburgh School, but the long splint, he agreed, was an abomination. It had been said that much more care was required in treating with massage and movement than with the splint; on the other hand one required to be constantly watching the long splint to prevent anything going wrong. The patient sinks down in the bed, and angulation and internal rotation of the foot result. He was sorry they had been so long in finding out its disadvantages, and personally he had entirely given it up.

Mr Cathcart in reply thanked the Society for the kind response they had given to his paper. He had not tried Steinmann's apparatus, disliking the idea of putting nails into the femur, but if the results were always as good as Mr Thomson has found them he would certainly consider adopting it. With regard to the bending method in fracture of the neck of the femur, that was not, he thought, necessary, but he did not know whether an intra-capsular or an impacted fracture was referred to. He still used splints, and he had seen a fair number of cases, such as Dr Langwill referred to, in which there had been unsatisfactory results where no splints were employed. He could not help thinking that the bone after being replaced under an anæsthetic could hardly fail to come out of place if not supported for a week, ten days, or a fortnight by splints. In fracture of the humerus he still used splints and had not seen any harm result. Plaster and massage should perhaps replace the splint. In fracture of the clavicle he did not use splints—Sayres' method was better.

As regards Dr Langwill's remarks, it was sometimes very difficult to get the muscles and joints back to their normal condition. It was not his experience that by the Lucas Championnière method of treatment when the bones have united the muscles have returned to their proper power, but, as the President said, they had to turn out their patients too soon.

The difficulty in compensation cases was not that the patients could not have massage, but that they did not want it. A large number of such patients are quite satisfied if they are getting compensation, and they do not want to return to work. Unless the patient voluntarily exercises himself and makes active movements with the muscles Mr Cathcart defied the masseur to bring back power. That was one of the great difficulties in connection with the Workman's Compensation Act.

A special department for the treatment of fractures such as Mr Scott Carmichael suggested was, in Mr Cathcart's opinion, unnecessary. When these cases were treated along with other conditions the students had their attention directed to them, and it was very important that they should see the treatment carried out; if all the fractures were put in one ward, where the students were not obliged to go into, they would not see as much of the treatment as they do at present.

He hoped the standard of treatment in the Edinburgh Royal Infirmary would be a very high one, and if they could turn out

their students well instructed in the treatment of fractures they would be doing a very great deal for the benefit of the people of the country at large.

Meeting VII.—May 1, 1912

Mr J. M. Cotterill, *President, in the Chair*

I. Election of a Corresponding Member

Frederick C. Shattuck, M.D. Harvard, LL.D. Cincinnati, Professor of Clincial Medicine, Harvard University, and Physician to the Massachusetts General Hospital, was elected a Corresponding Member of the Society.

II. Exhibition of Patients

1. *Mr Wallace* showed—

Partial œsophagectomy.

Mrs M'C., 60 years of age. Difficulty in swallowing and pain in throat began four months before admission. Difficulty gradually increased. Seen first in March 1912, when, on laryngoscopic examination, irregular "pasty wall cancer" area was observed at upper end of œsophagus. Larynx not involved. No glandular enlargement.

Operation, 5th April. Upper end of œsophagus with tumour removed.

Microscopic Report.—Squamous epithelioma.

2. *Mr Charles W. Cathcart* showed—

Gall stone acting as ball valve at neck of gall-bladder. Case shown on account of difficulties in diagnosis, and possible explanation of symptoms from what was found at operation.

George O'N., aged 37, was admitted to Ward 18, Royal Infirmary, on February 16th, 1912, suffering from a lump in the right side of the abdomen. This gave him almost constant pain, with frequent exacerbations, which frequently wakened him at night. There was no jaundice and no history of any. He had also an aching pain in the small of his back, but this had been present for many years. The severe pain in the right side had come on suddenly about two weeks before admission.

The lump moved with respiration and varied in position. It lay usually above and to the right of the umbilicus, but sometimes was found to the left of the middle line. A resonant note was frequently found between the lump and the lower border of the liver which came well below the ribs. The stomach was not dilated. No obstruction of the bowels. No definite diagnosis was made.

When the abdomen was opened the lump was found to be a thickened and somewhat dilated gall-bladder, containing one large stone—somewhat barrel-shaped—fitting securely into the neck of the gall-bladder with a few small facetted stones lying on its upper surface. The bile-ducts seemed to be clear of stones. The stones were removed and the gall-bladder drained and the side pains have disappeared. He still has some backache which may not, however, have had anything to do with the gall-stones.

The difficulties in diagnosis were explained (1) by the abnormal position of the liver and gall-bladder—which one did not expect to find in a strong working man and old soldier—the colon must have risen sometimes above the gall-bladder—and (2) by the ball-valve action of the gall-stone. It was too big to get into the cystic duct, and would allow bile to enter the gall-bladder, but would fall down again; this ball-valve action would no doubt explain the somewhat anomalous symptoms. Possibly a collection of gall-stones may sometimes act in the same way, but they would not make such an effective valvular obstruction as a single stone firmly grasped by the neck of the gall-bladder. It would prevent any of the smaller stones from escaping. From its large size it must have been present for a long time before it caused symptoms. Probably it only did so when it became firmly jammed at the neck.

3. *Mr J. M. Cotterill* showed—

Case of female patient in whom the upper three-fourths of the radius was removed for sarcoma, amputation having been refused. Recurrence of growth in region of neck of scapula, necessitating removal of entire upper extremity.

The President asked the opinion of the members with regard to the value of Coley's fluid. He had not found it of much use, having only had 1 out of 15 cases in which it had been of benefit. Coley's wonderful results were perhaps due to better methods and more enthusiasm.

Mr C. W. Cathcart, in 5 out of 6 cases, had had unsatisfactory results. The successful case was one of semi-malignant tumour, a sebaceous tumour of the scalp, which had been removed several times, but recurred in such size as to make it hardly justifiable to do anything more. The fluid was injected partly into the tumour and partly into the surrounding parts. It produced the usual symptoms—very marked rigour, sickness, and great distress—but eventually the patient did will. The condition might be called a malignant adenoma.

Mr A. Miles had found no benefit, and the patients suffered so much after the injection they would never have another.

Mr David Wallace thought he had had benefit. He did not know any case where benefit had occurred where the tumour was allowed to remain. In 3 cases of sarcoma of bone, which according to the statistics ought to have died, all 3 patients had lived, in 2 cases after amputation, and in 1 case excision of the tumour by mistake, it not having been recognised. All 3 patients were still alive, and he attributed the successful results to Coley's fluid.

The President said he thought it well to hear the opinion of others because it helped one in dealing with a case of this very serious and unsatisfactory nature.

III. Exhibition of Mask

Dr Torrance Thomson exhibited—

A mask for administering chloroform or etherby open or semi-open method, with adjustable dropper.

IV. Original Communications

1. ACUTE MYELOCYTHÆMIA ASSOCIATED WITH OSTEO-SCLEROSIS AND OTHER UNUSUAL FEATURES OCCURRING IN AN INFANT

By Alexander Goodall, M.D., F.R.C.P.

A female child aged 10 weeks was admitted to the Royal Hospital for Sick Children, under the care of Dr J. S. Fowler, on the 12th of March 1912. She was suffering from bleeding at the nose and diarrhœa.

History.—The patient had spent the greater part of her life in a kitchen bed-closet, but the hygienic surroundings were otherwise fairly good. Her father, aged 43, and mother, aged 38, were both strong and healthy. Patient was the seventh child. The second child died at the age of 10. He had been blind, and was said to have been born "with a clot on the brain." The third child died at the age of 5 months, cause unknown. The other members of the family were alive and healthy.

Present Illness.—The child has been fed on the breast since birth, and was in good health till three weeks before admission. At that time the mother noticed that the child was a bad colour, and then it began to bleed from the nose. The child was brought to the out-patient department of the hospital, where it was seen by Dr M'Neil, who found that there was jaundice and pallor. There was no enlargement of the liver or spleen. The epistaxis at first was slight and infrequent, but latterly became almost constant. Two days before admission bleeding began from some small excoriations in the gluteal region. There was fairly profuse diarrhœa, but no hæmorrhage from the bowel. Hæmatemesis also began two days before admission.

State on Admission.—The temperature was 96°, pulse 116. The child was small, and looked more like a child of 4 than a child of 10 weeks. The fontanelles were widely open, the hair scanty. There was great pallor, and the child was emaciated. There were no signs of rickets or syphilis. Thin watery-looking blood was oozing from the nostrils and also from some excoriations on the buttocks. There were fairly numerous petechial spots scattered over the trunk and limbs.

Alimentary System.—On the tongue there were a few small ulcers. The abdomen on inspection showed nothing abnormal. The liver was enlarged, and reached a point 1½ ins. below the costal margin.

Hæmopoietic System.—No enlarged lymphatic glands could be felt. The spleen was enlarged and easily palpable, reaching about an inch and three-quarters below the costal margin.

The Blood.—Blood flowed readily from a small puncture in the lobule of the ear, and bleeding continued for ten minutes afterwards in spite of the application of cotton wool and adrenalin. Red corpuscles numbered 1,100,000; leucocytes, 75,000 per c.mm.; hæmoglobin was 22 per cent. (Oliver); colour index, 1. The blood looked very pale and watery. Rouleaux formation was deficient.

There was considerable diversity in the size of the red cells, the average being increased. There was marked poikilocytosis. Polychromasia was fairly pronounced, and many of the red cells showed basophilic stippling. Nucleated red cells were numerous. Megaloblasts numbered 54,000, and normoblasts 48,000 per c.mm.

A differential count of the white cells was as follows:— Polymorphonuclear neutrophils, 26; large lymphocytes, 14.5; small lymphocytes, 9.75; eosinophils, 1.5; neutrophil myelocytes, 46; eosinophil myelocytes, 2; basophils, 0.25.

A notable feature in connection with the white cells was the difficulty in demonstrating the neutrophil granules. In films treated with Jenner's and by Wright's stain in the ordinary way the myelocyte granules did not stain at all, and the neutrophil granules in the polymorphs were of a much more blue tint than usual. As a result one's first impression was that there was something like seventy per cent. of lymphocytes, half of which were large and half small. In films stained with Ehrlich's triple stain and by Jenner's stain in full strength for two minutes and then in a dilute form for a further five minutes it was seen that the majority of the leucocytes present were myelocytes. Some of them were of small size. Many of the cells classed as large lymphocytes had deep basophil protoplasm and a vesicular nucleus, doubtless myeloblasts or pro-myelocytes. The difficulty of classifying them separately is the presence of intermediate forms. The other systems showed nothing noteworthy. The pulse was not easily felt at the wrist, but could be counted at the fontanelles. The heart sounds were closed. There was good expansion of the lungs. The knee-jerks were present, the plantar reflexes were extensor in type, and the child seemed to take some notice of its surroundings. The urine was not obtained.

Progress.—Pledgets of wool soaked in adrenalin 1-10,000 were applied to the nostrils and to the excoriations on the buttocks. The food ordered was albumen water, and 10 drops of whisky were given every four hours. Sickness occurred, and with the vomited albumen water there was a little dark blood. A motion green in colour was passed. It did not contain blood. The child became cold and collapsed, and a hypodermic injection of strychnine, subcutaneous injection of saline, and a mustard pack were tried in succession. Death occurred at 8 P.M. on the day of admission.

A post-mortem examination was made 16 hours after death

by Dr Carnegie Dickson. The subcutaneous and muscular tissues were pale. The serous membranes showed nothing of note. The heart muscle was pale, but there was no other obvious abnormality. The lungs showed numerous large irregular dark patches of collapse with a few hæmorrhages.

The *liver* was enlarged and smooth. On its upper surface there were some half a dozen rounded white thickenings in the capsule. These measured from 1 to 3 mm. in diameter, and were quite superficial. The surface otherwise was a dark green, and showed a mottled appearance due to the presence of innumerable little opaque greenish-grey points in the substance of the liver showing through the capsule. On section the appearance was irregular, dark greenish-brown areas alternating with dark red and less homogeneous-looking areas.

The *spleen* was enlarged. It was firm in consistence. There was slight fibrous thickening towards the surface in a few small areas. On section the colour was uniformly dark. No Malpighian bodies could be differentiated with the naked eye.

The *stomach* contained viscid mucus and some dark altered blood. The wall was pale but not markedly altered. The *intestines* were thin, pale, and atrophied, and covered with thick mucus. Here and there were deposits of dark altered blood. There was no ulceration and no enlargement of lymphoid tissue. *Lymphatic glands*, *thymus*, *thyroid*, and *suprarenals* showed no morbid appearance to the naked eye.

The *bones* showed a remarkable thickening. In the sternum and ribs the marrow was dark red, but was in very small amount. The cancellous tissue was very dense, and it was impossible to squeeze out any of the marrow. In the shaft of the right femur the medullary cavity was very narrow, and seemed to be crossed in all directions by thick trabeculæ of bone. The marrow here was also dark red, but again it was impossible either to express or excise a portion of marrow even moderately free from bone. In the shaft and upper diaphysis of the right humerus the same condition was found. The marrow was more abundant, but appeared to be all enclosed in small thick-walled bony spaces. It was just possible to express enough to make film preparations.

Microscopic Changes.—Portions of the organs were fixed in 10 per cent. formaline to which a few crystals of corrosive sublimate had been added. A portion of the humerus was afterwards partially decalcified in dilute nitric acid. The specimens

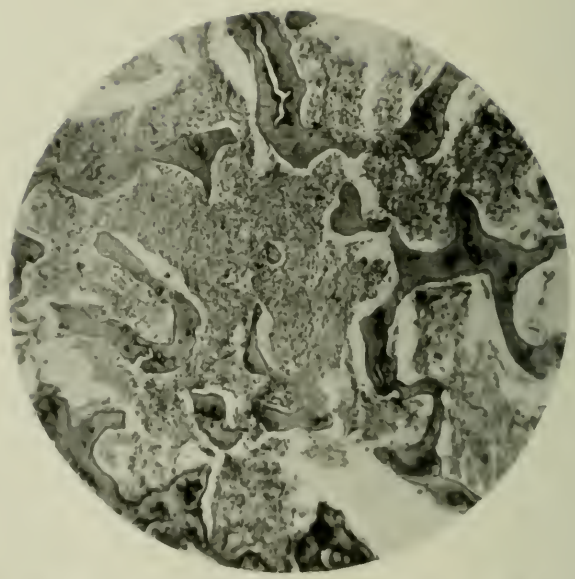

Fig. 1.—Transverse Section through the shaft of the humerus showing the thick bony strands and the absence of a defined medullary cavity and of fat-cells.

Hæmatein and Eosine. × 60.

PLATE 5.—TO ILLUSTRATE ARTICLE BY DR GOODALL

were embedded in paraffin, and sections were stained with eosine and methylene blue and hæmatein and eosine. Sections of liver and spleen were also stained by the ferrocyanide method for iron, with carm-alum as a counter-stain.

Liver.—The liver showed slight fatty change, and there were areas of cloudy degeneration with poorly stained nuclei. The liver cells, especially towards the periphery of the lobules, showed enormous quantities of golden-brown pigment which gave the free iron reaction to such an extent as to give specimens a uniform blue colour to the naked eye. Many of the bile capillaries and some of the smaller bile ducts contained masses of bile of a bright green colour. The amount of leukæmic infiltration was not great, but all the portal tracts were invaded, and there were scattered areas of cellular invasion between the liver cells. In these areas the invading cells were myelocytes, lymphocytes, eosinophils, and a fair number of nucleated red cells were present. Here and there in the sinusoids were large round cells, probably endothelial, a few of them containing pigment. One or two giant cells of bone-marrow type were also noticed.

Spleen.—The Malpighian bodies were small and inactive. In the pulp were the usual cells with islands of myelocytes and a few eosinophils. Nucleated red cells were no more numerous than in the peripheral blood. There was great abundance of iron-containing pigment, practically all intracellular. In ferrocyanide specimens the recticulum in many parts was mapped out in blue owing to the presence of iron in the endothelial cells. Many large free cells in the sinuses were so packed with iron pigment that they showed a diffuse blue against which the nucleus stood out in striking contrast.

Kidneys.—The kidneys showed little change. There were a few small areas of leukæmic infiltration separating the tubules in the cortex.

Lymph Glands.—There were no germ centres in the specimens examined. Many of the lymph paths were packed with myelocytes, lymphocytes, and eosinophils. A few large cells acting as phagocytes to red corpuscles were noticed.

Bone and Marrow.—Transverse sections of the softened humerus showed no definite medullary cavity (Fig. 1). There were a large number of spaces surrounded by thick bony trabeculæ. In many of these the remains of the primitive cartilage could be distinguished, but except for their thickness no abnormality could be detected.

The marrow showed a complete absence of fat cells. All the available space was occupied by hæmopoietic cells. The overwhelming number of these were myelocytes, but lymphocytes and eosinophils were also numerous. A fair number of basophils was scattered throughout. Nucleated red cells, both megaloblasts and normoblasts, were present. Giant cells were very scanty.

Points of Interest.—The case is of interest, in the first place, because of its rarity. Granting that my search through the literature has been exhaustive, then this case is the nineteenth recorded authentic instance of myelocythæmia occurring in infancy, and the twentieth case of myelocythæmia occurring in an acute form at any age. The association of leukæmia with osteosclerosis is still more rare, and I have found only two previous cases. Heuck describes a case in a man of 24. The diaphysis of the femur and humerus had an unduly thick and hard cortical substance. The marrow cavity was very narrow, and was crossed by a fine network of bone containing fibrous tissue and marrow cells. The sternum and ribs showed a similar change. There were no large masses of marrow, and only small drops could be expressed. The skull was heavy, thick, and compact. Schmorl describes a case in a man of 28. The spongy bone was nearly all compact, even in the spine, epiphyses of the long bones, and in the sternum. The cells were typical of leukæmia, but there was great fibrosis of the marrow. It may be noted that both authors specially mention the fibrous tissue in the marrow. In the case now reported the fibrous tissue was practically invisible.

A point of interest and importance is the difficulty which was found in staining the myelocyte granules.

Ehrlich and his school insisted strongly on the distinction between lymphatic leukæmia, which they regarded as a disease of the lymphatic tissues, and myelocythæmia, which was regarded as a disease of the bone-marrow. Cases, however, were recorded in which there was a blood picture of lymphatic leukæmia without glandular enlargement, and the view came to be commonly held that all leukæmias were marrow diseases. Pappenheim and Hirschfeld have reported a case which they regard as lymphatic leukæmia of lymphatic origin, but this is an isolated observation in modern hæmatology.

The result of the present position is that there may be confusion of nomenclature. For example Zypkin publishes a case of acute myelogenous leukæmia with the following counts:—

Leucocytes, 658,000 ; polymorphs, 1.5 per cent. ; lymphocytes, 3.6 per cent. ; eosinophils, 1.9 per cent. ; basophils, 0.2 per cent. ; myelocytes, 6.2 per cent. ; pro-myelocytes, 16 per cent. ; myeloblasts, 70.6 per cent.

Now one is far from denying that this was a case of myelogenous leukæmia, but the practical difficulty is this—While there is probably no doubt that the cells in such cases are undeveloped myelocytes in the physiological or ontogenetic sense, it is very difficult or even impossible in many cases to classify them as other than lymphocytes in the anatomical sense. The distinction between lymphatic and myelogenous leukæmia in the present state of knowledge must therefore turn on the existence or non-existence of neutrophil granules in the preponderating cells. Although Zypkin's case is recorded as one of acute myelogenous leukæmia, without denying its myelogenous origin, I prefer to regard it as an example of acute lymphatic leukæmia, a much more common disease. What is uncommon is the occurrence of leukæmia with the preponderating cells differentiated as myelocytes running an acute course.

The distinction is not merely one of interest to the hæmatological expert, since we know that cases of acute lymphatic leukæmia are usually affected prejudicially by the use of X-rays, while judging from experience of X-rays in the chronic granular form benefit might be expected in the acute cases.

To sum up : A case of myelocythæmia in an infant of ten weeks is described in which a fatal termination occurred in three weeks. The case appears to be the third on record in which leukæmia has been associated with osteosclerosis. There was considerable difficulty in staining the myelocyte granules.

I have to express my great indebtedness to Dr Fowler for asking me to see the case and for his kindness in handing it over to me for investigation and publication.

Discussion

The President said the Society was very much indebted to Dr Goodall for his very characteristically thorough and interesting, though perhaps slightly technical paper. No doubt there were many who could appreciate it better than he himself could, and they would be very glad if any gentleman would speak.

Dr J. Stewart Fowler had nothing to add to Dr Goodall's paper

except to thank him for bringing it before the Society, and personally to thank him for his examination of the case.

Two small points occurred to him. The first was in connection with the general question of leucocythæmia. It seemed a very remarkable thing that the form of leucocythæmia commonest in the adult—the myelocytic type—should be rare in children, while the form commonest in children—the lymphatic type—should not be so common in the adult. This was the first case of this kind he had seen, whereas he had seen at least 20 of the lymphatic type occurring in children. One knew that in many blood diseases in children, myelocytes tend to occur in the blood with the greatest frequency, and in other conditions apart from the one under discussion they occur much more frequently than in the adult.

The second point was that he thought it rather a pity that the triple stain for staining films had been so much given up. No doubt it brought out the granules better than any other. Of course in the hands of an expert like Dr Goodall equally good results were obtained by Jenner's stain. Very few of the "Residents" could make good films with Jenner, whereas Ehrlich's triple stain was quite easily used.

Dr Goodall's argument that all turns on the granules reminded Dr Fowler of a case of leucocythæmia in a child which occurred some little time ago, in which he regarded the condition as a "mixed" one, while Dr Goodall and Dr Gulland took diametrically opposed views, the former considering it a lymphatic case, the latter a myelocytic.

Dr W. T. Ritchie had not heard the whole of the paper and therefore was perhaps hardly in a position to discuss it; however, he had heard the concluding part and it raised a great many very interesting questions. He gathered that Dr Goodall from the earliest examination of his case, if he had not used Ehrlich's stain, would have been inclined to regard it as an acute lymphatic leucocythæmia, and that it was finding more or less abundant granules which enabled him to differentiate it as acute myelogenous leucocythæmia. The case reminded him of one of Dr Fowler's which came under observation some seven or eight years ago. Films and portions of the bone marrow were sent to Dr Hugh Stewart, who is now Professor in the Columbia University, and there was great difficulty in differentiating between acute lymphatic and acute myelogenous leucocythæmia. After full consideration the con-

clusion arrived at was that it was a " mixed " case, somewhat like the one which Dr Fowler published. In it the blood picture was extremely like the condition which Dr Goodall describes in his case. Although there were some definite myelocytes, the great majority of the abnormal cells were large and had extremely few granules, many of them none at all, and yet the blood picture was very like a large-celled acute lymphatic leucocythæmia.

What is really the term which should be applied to some of these forms of leucocythæmia—myelogenous or lymphatic ? Personally in some cases he had great difficulty in being able to say whether the case is a lymphatic or a myelogenous leucocythæmia, because in very many cases where there are large glandular swellings, and where the case looks at first sight, and even on close examination, to be lymphatic, it is found that some of the cells are myeloblasts containing granules. He was inclined to regard these cases not as lymphatic in origin, but as very acute myelogenous leucocythæmia, where the cells have not had time to form ; they are in a much earlier form than the ordinary myelocyte. It was interesting to hear from such an authority as Dr Goodall that there is still considerable difficulty in classifying some of these forms of leucocythæmia.

Dr Alexander Goodall in reply said he was much interested in what Drs Fowler and Ritchie had brought forward, but if he answered them in anything like detail, he would keep the meeting till 2 o'clock, which was, he thought, the time the Pathological Club remained on the occasion to which Dr Ritchie referred.

With regard to the frequency of lymphatic leukæmia in children and the rarity of granular forms, one had to remember the pathology of these leucocythæmias. They are really malignant diseases—sarcomatoses of the marrow. One looks upon the lymphatic cases as being a proliferation of the less differentiated cell, and therefore a more malignant condition ; that, he thought, fitted in fairly well with the conditions in children. Children normally have a larger number of lymphocytes than myelocytes. The " mixed " case to which Dr Fowler referred occurred before the days when it was recognised that all these leucocythæmias were marrow diseases, and that answered a great deal of what Dr Ritchie said. What Dr Ritchie said about using Ehrlich's stain was possibly true ; he (Dr Goodall) used it deliberately, because of the fact that there was only 70 per cent. of lymphocytes ;

had it been lymphatic leucocythæmia one would have expected 90 per cent. of lymphocytes.

With regard to differentiation there was really not much difficulty. The diagnosis depends not upon the enlargement of the organs, but upon the existence or non-existence of granules. One must look upon the condition as a marrow disease, and the glandular disease only as an accident and not as an indication of the chronicity of the disease.

Literature.

Cases of Acute Myelocythæmia.

1. Van der Wey, *Deutsch. Archiv. f. klin. Med.*, 1896. 2. Thomson and Ewing, *New York Med. Record*, 1898. 3. Bramwell, *Anæmia*, 1899. 4. Arneth, *Deutsch. Archiv f. klin. Med.*, 1901. 5. Grawitz, *Klin. Path. d. Blutes*, 1902. 6. Michaelis, *Zeitschr. f. klin. Med.*, 1902. 7. Hirschfeld and Alexander, *Berl. klin. Wochenschr.*, 1902. 8. Stewart and Campbell, *Montreal Med. Journ*, 1902. 9. Türk, *Wien. klin. Wochenschr.*, 1903. 10. Billings and Capps, *Amer. Journ. Med. Sci.*, 1903. 11. Gordinier, *Johns Hopkins Hosp. Bull.*, 1904. 12. Elder and Fowler, *Edin. Med. Journ.*, 1904. 13. Lazarus and Fleischmann, *Deutsch. med. Wochenschr.*, 1905. 14. Ewing, *New York Med. Journ.*, 1905. 15. Falconer, *Lancet*, 12th May 1906. 16 and 17. Hirschfeld, *Berl. klin. Wochenschr.*, 1907 (2 cases). 18. Burkhardt, *Frankfurter Zeitschr. f. Pathol.*, vi. 2. 19. Rieux, Savy, and Courjou, *Arch. des Maladies du Cœur, des Vaisseaux et du Sang*, 1910. Hardman, *Brit. Med. Journ.*, 1911 (no hæmatological data). Obrastow, *Deutsch. med. Wochenschr.*, 1890 (two doubtful cases).

Cases of Myelocythæmia in Infancy.

1-6. Hutchison, *Lancet*, 1904 (could find only five authentic cases, and adds a sixth). 7. Ginsburg, *Inaug. Diss.*, Zurich, 1905. 8. Zyberlast, *Thèse de Genève*, 1906-7. 9. Falconer, *Lancet*, 1906. 10. Ziegler and Jockmann, *Deutsch. med. Wochenschr.*, 1907. 11. Benjamin, *Munch. Gesellsch. f. Kinderheilk.*, 1908. 12. Abt, *Arch. Pediatrics*, 1908. 13. Karsner, *Pennsylvania Med. Bulletin*, 1910. 14. Whipman, *Proc. Royal Soc. of Med.* (section, Children's Diseases), 1911. 15-17. Sternberg, *Wien. klin. Wochenschr.*, 1911 (three cases in association with acute febrile diseases). 18. Pollmann, *Munch. med. Wochenschr.*, 1898 (records a case which he regards as congenital). Cassel, *Berl. klin. Wochenschr*, 1898, and Rivière, *Trans. Royal Med. and Chirurg. Soc.*, 1903, give references to cases which Hutchison regarded as non-authentic.

Cases of Leukæmia with Osteosclerosis [1]

Heuck, *Virchow's Archiv*, 1879, p. 475. Schmorl, *Munch. med. Wochenschr.*, 1904, p. 537.

References in Text.

Pappenheim and Hirschfeld, *Folia Hæmatologica*, v., 1908. Zypkin, *Berl. klin Wochenschr*, 1910.

[1] Since the above was written Dr Parkes Weber has kindly drawn my attention to a case of "Acute Ménière's symptoms in spleno-medullary leuco-

2. INSUFFICIENT DATA AS A CAUSE OF FAULTY INTERPRETATION OF RADIOGRAPHS

By ARCHD. M'KENDRICK, F.R.C.S., Medical Officer jointly in Charge of X-ray and Medical Electrical Department, Royal Infirmary, Edinburgh

(With Lantern Demonstration)

SEVERAL sets of circumstances are responsible for the title of this paper. If it does nothing else it will show the disadvantages which may result from our modern methods of specialisation. Unfortunately this tendency towards extreme specialisation is accompanied by an increasing dissociation and lack of intercommunication between those engaged in the various branches, which, when taken together, go to make up the whole domain of medicine and surgery. Radiography is of fairly recent origin, and its divergence from the mother subjects is perhaps the more conspicuous on that account.

In fact, we are at a critical point in its history, and it must soon be settled what the true position of the radiographer really is in relation to diagnosis. Is he to be merely an expert X-ray photographer, whose duty is at an end after he has furnished the physician or surgeon with the finished negative, or must he be at once an anatomist, a pathologist, and a radiographer, capable of assisting his colleagues in diagnosis ?

Most assuredly the latter is the only means by which the full benefits of radio-diagnosis can be attained. As a concrete example of this, radio-pelvimetry might be quoted.

The Maternity Hospital staff are now sending some of their patients to the radiographer for measurements of the internal diameter of the pelvis. These radiographs are taken under certain anatomical and mathematical conditions.

Now, any such radiograph is of no value to the obstetrician, even although he may possess an X-ray pelvimeter or skiameter, because he has not the necessary anatomical and mathematical data to enable him to apply the radiograph to the pelvimeter. In other words, he does not know the exact conditions under which

cythæmia" published by him (*Medico-Chirurg. Trans.*, London, 83, 1900, p. 185). In that case there was greatly increased bony formation in the internal ear and semi-circular canals.

The bones of the ear were the only ones examined, but Dr Parkes Weber tells me that he has no doubt that the case was an example of leukæmia with osteo-sclerosis.

the radiograph was taken. This absence of data obtains in nearly every radiograph supplied to the physician and surgeon at the present day, and is the most fertile source of inaccuracy in radio-diagnosis.

At a recent meeting of this Society Mr Stiles said, in reference to radiography of the stomach, that surgeons are more frequently misled than helped by it. One cannot refute the statement of such an authority, and, personally, I would like to take the opportunity of thanking him for pointing out that there is something wrong somewhere. It is worth pondering over, for X-rays are so mathematically exact on their projection that radiographic pelvimetry is possible. Why, then, should radiography of the stomach ever mislead the surgeon ?

It cannot be accounted for on the grounds of faulty interpretation : it is not always due to faulty technique on the part of the radiographer, but is the direct result of a want of collaboration with its consequent insufficiency of data.

The fault is divergence of specialisation ; but, let the surgeon or physician and the radiographer mutually furnish sufficient anatomical, pathological, and mathematical data, and the fault will disappear. Radiography would then become an absolutely reliable diagnostic acquisition.

This winter, in the Royal Infirmary, Mr Struthers has aimed at obtaining more data than usual from the X-ray department, in reference to certain shoulder conditions which he is at present investigating. This has been of great mutual benefit, and has added further proof of existing insufficiency of data, and of the necessity for collaboration.

Along with my colleague, Dr Hope Fowler, I am diagnosing and classifying all the radiographs taken in the electrical department of the Royal Infirmary, with the view to establishing in that institution a reference library of X-ray photographs.

During the past six months we have taken over 3000 X-ray photographs, and have thus had ample opportunity of forming an opinion on the deficiency of existing methods. The diagnosis of many of the plates is impossible on account of the insufficiency of data supplied to us by the surgeon, and on account also of the inefficiency of our record of radiographic technique at the time of taking the photograph.

It is with the object of increasing radiographic data that this paper is written ; but in the time at my disposal I can only indicate

the nature of, and the broad lines on which we may obtain, such data.

The surgeon knows what he wants, but does not, as a rule, know how his object may be obtained radiographically. The radiographer can help him in this if the surgeon would confer with him, and the following points, if noted, will help in their mutual work :—

A skiagraph is only a shadow picture, and is subservient to many factors.

Firstly, with regard to the tissues to be radiographed. X-rays penetrate different substances approximately in inverse ratio to their specific gravity—the higher the specific gravity the greater the opacity to X-rays. The harder the X-ray tube the more penetrating are the rays given off from it.

From these two facts it will be easily seen that if the surgeon wishes, for example, a skiagraph of a joint, it will be to his advantage if he advises the radiographer whether he suspects synovial or bone mischief, for then only will the radiographer be able to select a tube suitable for the case. A soft tube is required for showing structures of such low specific gravity as serum (sp. gr. 1035) or blood (sp. gr. 1055), whereas a harder tube is required if the structure of bone must be shown.

Secondly, with regard to the position of the limb. If we take, for example, the hip-joint, the degree and direction of rotation of the femur when the radiograph is taken modifies to an astonishing degree the apparent anatomical relations of the parts. The neck looks long and thin if the limb be in slight internal rotation. The neck may appear thick and short in extreme rotation in either direction according to the selected focus point of the tube. If the thigh is flexed the radiographic appearance may be that of coxa valga. The epiphyseal lines about every joint are very misleading in the various positions.

Thirdly, with regard to the position of the X-ray tube. The absence of data regarding this is perhaps the commonest cause of faulty interpretation of medical and surgical radiographs. Normal stomachs are diagnosed as dilated or displaced, bones are diagnosed as dislocated, and fractures in malposition when the focus point is inappropriately chosen or not recorded. This should not be, for so-called distortion is mathematical, and can be easily calculated provided we have sufficient data regarding the focus point of the tube.

Such data can be supplied by the radiographer. If the relative

position of the focus point and the plate be known, and the distance of the organ or structure from the plate be also known, the actual measurement of the organ is easily accomplished. By a collaboration of surgeon and radiographer most of our present pitfalls would be obviated.

With regard to the selection of the X-ray tube in a special case, let the surgeon advise the radiographer as to the probable diagnosis, and the radiographer will select an X-ray tube suitable to show the tissue or structure required. With regard to the best position of the limb and the selection of the focus point, one cannot at present lay down any golden rule, because up till now there has been insufficient collaboration. The question is not yet decided, but before long we may have established a series of " normal positions " and " normal focus points " to be adopted in every ordinary radiograph. It will then be possible to compare various radiographs, for, after all, our diagnosis is based on a comparison with the average.

In any case the surgeon should be supplied with the following data, viz. :—(1) The position of the limb, and (2) the relative position of focus point and plate at the time of examination.

In private I have adopted the practice of recording the focus point and its distance from the plate, and also the position of the limb during the examination. This at least gives the surgeon a little more diagnostic data than hitherto.

Regarding " normal positions " and " normal focus points," I hope in the near future to lay before my medical and surgical colleagues a series of these normal points. By a consideration and criticism of these we may eventually be able to establish a standard series of normal points and positions, and thus attain the fullest benefits which radiography can offer as a diagnostic aid.

Discussion

Dr Harry Rainy thought the Society owed a debt of gratitude to Mr M'Kendrick. The points brought out, although well known to the radiographer, were not well known to those in general work. Really, as was stated, the whole question is mathematically correct, and the great point is to have these mathematical points worked up, when we can expect absolute certainty. The way in which Mr M'Kendrick does it is as good as any, having definite lines marked in measurable positions. The only other way, which is

the one used to a large extent in the Research Laboratory, is the orthodiagraph, by which direct measurements can be taken without involving mathematical calculations. The orthodiagraph is not so useful as a well-taken X-ray photograph in which measurements can be taken from certain points.

Mr H. J. Stiles endorsed very fully what Mr M'Kendrick said, that the more the radiographer learns from the surgeon the better for the radiographer, and the more the surgeon learns from the radiographer the better for the surgeon. Without the collaboration of the two a correct interpretation of radiography would never be got. If the X-ray is mathematically correct, as Mr M'Kendrick says, why does it not always show what the surgeon finds when he opens the abdomen ? Of course the surgeon must learn to read the X-ray photograph correctly. There could not be a better example than a case which came under his observation that morning, sent by Dr Gibson to Chalmers Hospital. The patient had complained of indefinite stomach symptoms which were not sufficient to point to any definite lesion. He had possibly a dilated stomach. An X-ray after a bismuth meal showed a very extraordinary appearance ; the pylorus was just about the level of the upper border of the pubis, and the stomach itself was very extraordinary indeed. No veryi mportant deductions were drawn. The state of affairs with which the surgeon had to deal was very different. A small incision was made between the ensiform cartilage and the umbilicus, but no stomach was seen. The lower margin of the liver was in the normal position ; immediately below that, between the lower margin and the umbilicus, the transverse colon was seen. Further examination revealed the fact that the lower curvature did not even reach the ensiform cartilage. No ulcer was found, and there was no evidence of an atonic condition of the stomach. On examining the right and left fossæ a beautiful example of the appendix adherent to the lower layer of the mesentery was found. The appendix and adhesions were removed, and the patient, they hoped, would be cured. He wanted to point out to the general practitioner, however, that if he gets an X-ray, he is to be careful as to what conclusions he draws. He had also had misleading photographs of disease in other parts of the body. He did not undervalue the radiographer, but there must be a good deal of collaboration between the physician and the radiographer. To give another example, a patient had been sent to him by Dr Edwin

Bramwell with some pain down the ulnar side of the upper extremity, and weakness and atrophy of the muscles of the hand; diagnosis, "a lesion of the 1st dorsal nerve, probably a cervical rib." The patient was X-rayed, and there was a shadow which was taken for a cervical rib, a view which was supported by a diagram in a paper written by Mr Thorburn—a great authority on cervical rib—showing exactly the same condition. The patient was operated on, and when X-rayed after the operation it was seen that the greater part of the first rib had been removed, and that that was the shadow which we had taken for a cervical rib; however, the patient was cured. In about two months a second case of cervical rib was sent to him, also by Dr Edwin Bramwell, and the same thing happened. Many examples of errors arising from want of anatomical knowledge might be given; there is no doubt that one requires to be very careful as regards one's anatomy in dealing with this condition. Sir William Turner saw the photograph of the second case of cervical rib, and after looking at it more carefully, said he really ought to have known. On investigating the 7th cervical process considerable variations were found.

Then there were various other pitfalls; he remembered a case which showed that the radiographer should be cautious in sending in his report, and not rashly make a diagnosis. The patient was a child who had some spastic symptoms in the lower extremities; there was a considerable swelling in the sacral region, said to be due to fæces and gas; on examination, Mr Stiles found a projection about the middle dorsal region, and the patient suffering from dorsal caries.

Now, what is the explanation of the position of the pylorus? There was no doubt that if a normal stomach was photographed, say in a horizontal position, after a bismuth meal it would give an extraordinary result. They had yet to learn what the various positions of the different viscera are in varying positions of the patient, and also how they are influenced by pathological conditions.

It would be a good thing if the radiographer could be in the operating theatre and see the operation; it would be a great advantage, and he would learn a great deal just as the surgeon does.

Mr David Wallace agreed that the Society was very much indebted to Mr M'Kendrick for bringing forward this very interesting subject. They remembered that with regard to bullets

and foreign bodies a great deal of attention had been paid to the definite position, and in the early days of radiography everything was done to locate bullets and needles with extreme accuracy. A number of years ago it was pointed out that through distortion one might have a bone where a fracture had occurred apparently in a mal position—badly set ; or, *vice versâ*, a bone in a bad position apparently in a good position. In both conditions, of importance to the surgeon, the surgeon and the radiographer paid much attention to perfecting their methods both of locating a foreign body and of having proper photographs taken, with good results. What is happening to-day is merely the evolution of radiography, and errors in the newer departments have to be corrected just as they had to be corrected at first in surgery. Many surgeons must have felt that a more intimate relationship between the radiographer and the surgeon would be a great advantage, and he thought they should heartily welcome Mr M'Kendrick's endeavour to meet this need. He did not expect the radiographer to be merely an expert photographer. As a surgeon he was only too anxious to give information in taking the photograph in the best possible way. He also could give examples of errors in interpretation, for example a case of cervical rib where the greater part of the 1st rib was removed in that belief ; he, with others, had the greatest difficulty in saying whether it was a cervical rib or not.

Dr W. T. Ritchie had listened with great interest to the paper. His experience was that the closer the intercommunication between the physician and the radiographer the better for the physician—he did not say it was better for the radiographer, but certainly for the physician. Such intercommunication as Dr Rainy referred to exists in the Clinical Medicine Laboratory of the Royal Infirmary. The work which he had had the pleasure of doing with Dr Hope Fowler and Mr M'Kendrick showed tha value of this intercommunication. If one is observing a stomach case for X-ray diagnosis, one likes to see more than an X-ray photograph. He had seen examples of patients who had been sent to the X-ray department with a bismuth meal inside, and owing to some cause or other, the bismuth meal was not visible in the photograph—possibly the patient had been allowed to sit an hour or more in the Electrical Department, until the meal had left the stomach ; therefore the photograph did not give the information wanted. If the

physician wants to get the best information, he should go and see the screen picture, not the photograph, and see the stomach moving, see in what direction, if any, peristalsis is taking place in the stomach, and how soon the stomach is emptied. In all such matters the screen examination will give the physician a great deal more important information than the photograph. It is only by the physician associating himself with the radiographer at the time of the examination that an X-ray diagnosis of stomach affections can be made. The same with regard to the thoracic organs. For example, in the case of an enlarged heart, the X-ray photograph as a rule gives the physician very little information compared with the information he can get by going down and seeing the shadow on the screen, by getting the patient to move into various positions, and seeing the actual shadow of the aorta, heart, or lung, when the patient is seen in different positions.

Mr J. W. Struthers said he had recently spent a good deal of time in the X-ray Department, and he thought with mutual benefit both to the radiographers and himself. He was impressed by how little co-operation there had been in the past—patients are sent down repeatedly without any information to the radiographer, and the radiographer comes in for a little criticism which is not altogether justifiable. Another point is that none of them are half enough educated in the interpretation of X-ray photographs. A student goes out almost quite ignorant! With regard to the interpretation of the cervical rib cases, the mistake in interpretation was in all probability due to imperfect anatomy. Mr M'Kendrick has the qualifications of an anatomist, radiographer, and X-ray photographer, and had put in a plea for such, still the practical point is to produce a perfect photograph and then, in the majority of cases, the interpretation will be fairly easy.

Dr A. Goodall said the difficulty in estimating X-ray photographs was not surprising since quite recently there was a competition in one of the sixpenny magazines in which one was asked to recognise quite commonplace objects from an unusual point of view.

The President said that all agreed that Mr M'Kendrick's position was quite unassailable, namely, that more collaboration is required; but he ventured to suggest one point. Mr M'Kendrick says if the

surgeon thinks the condition is synovial disease, let him say so. Is that not giving away the show? If a man has gout and goes to a gout specialist, he has got to have gout. If a patient has synovial disease and is sent to the radiographer, then he has got to have synovial disease.

Then another point, from which he was sure the pathologists would strongly dissent, is—Is it good or bad policy to send the details of cases—a bit of a tongue, for example, which one wants to cut out—to the pathologist? He (the President) maintained that the surgeon was there to interpret the clinical side, and that the pathologist should not know clinical surgery, and should give a purely pathological opinion. If the surgeon begins by telling the pathologist what it ought to be, is it not human nature that the pathologist will say that it is so? He thought the point was worth consideration.

Mr M'Kendrick, in reply, said he was sorry he could not see exactly eye to eye with the President. The radiographer was not exactly in the same position as the pathologist; the radiographer supplied the photograph, and the surgeon made the diagnosis, whereas the pathologist supplied the diagnosis as a rule. Before they could definitely give a photograph showing a synovial membrane, they must know that it is suspected, or else it must be done by accident. Unfortunately X-ray tubes are rather difficult to work. Mr Struthers talked about perfect photographs; they must plead guilty to imperfect photographs, but they were not really at fault. The X-ray tube was like a restive horse, one never knows what it is going to do—it may be soft or it may be hard. Until they could be supplied with tubes which would remain stationary, and until they learned to keep them stationary, he was afraid they must always plead guilty to supplying some bad negatives. Dr Goodall's remark was quite analogous to choosing a focus point. As Dr Rainy said, certainly the orthodiagraph is more exact than any radiographic method, but very few institutions and very few private persons could afford to buy the apparatus. The method he (Mr M'Kendrick) had introduced involved no expensive apparatus. Mr Stiles' name had not been taken in vain, he (Mr M'Kendrick) had simply quoted the statement he had made at the last meeting of the Society, namely, that surgeons were more frequently misled than helped by radiographs of the stomach. Personally he

should very much like to follow the patient to the operating table, and was well aware that one did not always find at the operation what was seen on the X-ray plate. Two photographs of the stomach after a bismuth meal might be totally different. The position of the stomach did not seem to be so important as the way in which the stomach does it work—if one sees a stomach trying to throw food into the duodenum, one knows that food is getting through; but frequently if there is a scirrhus of the pylorus, one will find no food getting through; therefore he agreed with Dr Ritchie that medical cases were infinitely better seen on the screen. In the cervical rib cases referred to, the interpretation might be due to faulty plates, but with all due deference to Mr Stiles he would be inclined to think that it was due to faulty anatomy. Personally he had studied anatomy for two years and was constantly finding out new anatomical facts. Mr Struthers mentioned that he had learned things in the Electrical Department, but he certainly had pointed out anatomical facts about the shoulder that he (Mr M'Kendrick) did not know. Mr Stuart brought down a case, and in it neither Dr Hope Fowler nor Mr M'Kendrick could tell the anatomical relations; as a matter of fact, they did not know X-ray anatomy. They should record the facts in each case, and if this were done in several cases they would be able in future to compare different regions of any part of the human body.

Mr Wallace alluded to the location of foreign bodies. That certainly had been a difficulty for long in radiography, and it was difficult to say which method was really best. As regards fracture and distortion, he was sorry to disagree with Mr Wallace, who made the statement; he thought that a bone may be in a good position and yet appear as if the fracture had been badly set, and also in a bad position and appear properly set. He quite agreed that a bad position of a fracture might appear good, but if a fracture is in a good position he could not see how it could possibly appear bad.

(Mr Wallace explained that a good position was a relative term, and that if there is a very small interval that interval may be considerably increased by distortion, and may seem worse than it is.)

Mr M'Kendrick was sorry he disagreed; radiographers were generally disagreeable—that was probably the reason why so few of their surgical friends came down to their department! They should try to work together daily.

Mr Struthers had relieved him from grumbling at the scanty data obtained of the patients. It is the Resident who is responsible for that, but it shows that the Resident has never seen an X-ray photograph taken. Patients are sent down with the request that a photograph be taken of the thorax, pelvis, or abdomen and no indication as to which part it is desired to see.

If they could establish definite focus points and definite positions, then one could be perfectly certain to get the same focus on subsequent occasions. The radiographer should also get a definite statement of the position of the lesion wanted to be shown on the X-ray photograph.

Meeting VIII.—June 5, 1912

Mr J. M. Cotterill, *President*, *in the Chair*

I. Exhibitions of Patients

1. *Mr Scot Skirving* showed—

(*a*) Boy, æt. 12, six months after transplantation of left fibula to replace deficiency in right tibia. (Skiagraphs.)

History.—June 1911, subperiosteal resection of tibia for tubercular osteomyelitis; healing per primum: no reproduction of bone after $5\frac{1}{2}$ months.

Nov. 1911, subperiosteal transplantation of five inches of *left* fibula as above. Firm union.

(*b*) Youth, æt. 17, after repeated operations on bones of left leg. (Skiagraphs.)

History.—Chronic osteomyelitis of left tibia with sinuses.

Aug. 1909, subperiosteal resection five inches of shaft: sepsis: very limited reproduction of bone.

June 1911, resection of fibula corresponding to gap in tibia, and wiring of both bones: non-union.

Nov. 11, uniting both bones (Lane's plates)—operation complicated by a Brodie's abscess in upper segment of tibia. Firm union.

2. *Dr Edwin Bramwell* showed—

Myotonia atrophica.

Female, 36, single. Three years ago noticed slowly progressive weakness of legs. *State.*—Paresis of lower limbs, affecting anterior tibial, peroneal, and quadriceps groups; also of sternomastoids

and face; infraspinatus enlarged (?); flexors of fingers myotonic; tendon jerks diminished; no fibrillation or sensory symptoms; no family history of myotonia, myopathy, or cataract.

3. *Mr J. W. Struthers* showed—

Patient, æt. 23 years, after amputation at shoulder-joint for ACUTE ARTHRITIS of shoulder and osteomyelitis of humerus associated with syringomyelia.

4. *Dr G. A. Gibson* showed—

(*a*) Patient, aged 31, began four years ago to have weakness of vision, and soon after enlargement of hands and feet, with protrusion of lower jaw. The present condition is one of well-marked acromegaly, with changes in the size of the lower part of cranium and face, as well as of the extremities. There is partial bitemporal hemianopia.

(*b*) Patient, aged 41, felt weakness of legs about a year ago, with coldness and lethargy. Her state now is one of well-marked myxœdema, with some improvement as the result of treatment for two months.

5. *Mr Charles W. Cathcart* showed—

Case of CEREBRAL DEPLEGIA in a young girl. In process of treatment. The patient shows most of the typical symptoms, and has improved in several ways after resection of adductor tendons and division of the tendo Achillis on both sides, with subsequent treatment with splints and massage.

Case of deformity in both hips following a bicycle accident in which the right side was injured, in a lad of 19. Arthritis deformans?

II. EXHIBITION OF SPECIMENS

Mr J. W. Struthers showed—

(*a*) Knee-joint showing changes in "Charcot's disease."

(*b*) Humerus showing changes following arthritis of shoulder and osteomyelitis in case of syringomyelia.

III. Original Communications

1. THE CARE OF THE TEETH IN RELATION TO THE HEALTH OF CHILDREN AT THE SCHOOL AGES—THE PROVISION OF SPECIAL SCHOOL DENTAL CLINICS

By L. Storrow Shennan, L.D.S. (Edin.), D.D.S. (Penna.).

The longer one practises as a dentist the more one realises that much of the caries which is so common both in the young and in the old, and the diseases consequent upon it, are preventable. I have realised this to the full in the course of my ordinary private practice, and latterly have been interesting myself more particularly in the care and regulation of the teeth of young children. Eighteen months ago this interest was deepened when I was afforded an opportunity of gaining a more extended experience of this kind of practice on my appointment as School Dentist to the Carnegie Dunfermline Trust. I shall give you some details of this special work later, but in the first place I should like to refer to the means provided in this and other countries for dealing with the evils of dental caries during the school ages.

In Russia, as early as 1879, attention began to be drawn to the necessity for care of the teeth of school children. In that year Professor Sklifosovosky examined 400 school children in St Petersburg and found that 72 per cent. of these has carious teeth. In 1882 Dr Palmovitz examined students in one of the towns of Finland and found that 45 per cent. required actual treatment. He concluded that the children of the wealthy suffer more from caries than do those of the poorer classes.

Subsequently distinct advances were made, and in 1896 a Commission was appointed by the Society of Russian Dentists. Professor Limberg was chairman, and the Commission decided that—(1) It is necessary and compulsory that children's teeth be examined, and admission to the schools granted only to those with teeth naturally healthy, or rendered so by appropriate fillings. (2) To eradicate disease every school should have a dentist to examine the children's teeth twice a year, and to give them the necessary treatment.

In the military schools comfortable dental offices have been fitted up, and the dental officers are required to take care of the mouths of the pupils, and to use prophylactic measures; to accustom the children to daily care of the teeth; to keep a detailed

record, with observations, as to results obtained; and to present a report on expenses and on materials used.

In Germany also it is a considerable time since the first attempt was made to educate the public as to the relation between dental hygiene and general health.

In 1861 the Central Committee of German Dentists offered a prize for the best work upon this subject. This was awarded to Suersen in 1864.

In Strasburg, in 1902, after seven years' agitation, Dr Jessen obtained permission to establish a municipal school clinic. A sum of money was voted for the purpose, and this clinic is now worked under the best conditions. The inspections are made at the schools, and the pupils are sent under the supervision of the teaching staff to the clinic, chiefly out of school hours, though when the condition of the teeth is very bad, pupils are allowed to attend during the school hours, but only two from the same class at one time. Attention to the teeth of children between the ages of three and six is compulsory. Pupils with bad teeth are not allowed into the vacation colonies (holiday camps), and they are not allowed to attend school if they refuse to have their teeth attended to. Toothbrushes are provided for children by the school management, and the school dentist demonstrates how to use them. Lectures are given to teachers, and conferences are held to which parents are invited.

Upon the inspection charts which are sent to the parents of the children requiring attention the following "rules of dental hygiene" are printed. The child brings this chart each time he attends the clinic.

"1. At the age of 2½ years children have 20 teeth.

"2. At the age of 6 years the first permanent teeth erupt on the surface of the mouth—first molar.

"3. From 7 to 14 years replacement of the teeth goes on.

"4. At the age of 12 years the second large molars erupt—at the age of 18 years to 40 years the third molars or wisdom.

"5. Good teeth are indispensable for the health of the stomach and the whole body.

"6. The milk teeth are more important in the child than the permanent are in the adult.

"7. Healthy milk teeth ensure good permanent teeth.

"8. From the earliest possible age the teeth should be brushed twice a day—in the morning, and especially at night.

"9. From 3 years it is necessary to have the teeth examined every six months by a dentist.

"10. When the teeth decay they should be filled before they cause pain.

"11. The mouth, which is the entrance into the body, ought to be kept completely healthy.

"12. In order to keep a healthy mouth it is necessary that all roots be extracted when they cannot be filled.

"13. To masticate well is to digest well—that is the chief reason for taking care of your teeth."

The result of this work is seen in the report of the inspector of the Strasburg schools. This report states that instead of the schools suffering, it has been found that the children actually lose less time in undergoing treatment than in remaining away from school while suffering from toothache. Increased strength—physical, intellectual, and moral—is evident, and therefore the interests of the schools themselves benefit. Many other towns in Germany have followed the example thus set by Strasburg, and at the present day there are 119 school dental clinics in Germany.

In France less has been done than in either Russia or Germany. Up to 1908 no attempt was made to introduce dental hygiene in the communal schools. As a matter of fact an existing law prohibits a dentist from entering the precincts of a school. Apart from the teachers, only inspectors, cantonal delegates, and doctors can enter it. It is thus only by courtesy that a dentist is allowed to make inspection of the mouths of children attending these schools, and this is carried out only to a limited extent in some of the colleges and higher primary schools. The fault lies a good deal with the dental profession in France, who do not show sufficient energy in advancing their claims.

In the normal schools and boarding schools supported by the State a dental service has been organised. Two dentists are nominated—one to inspect, and the other to operate. The pupils are examined twice a year, and charts indicating any necessary treatment are sent to their parents, who take the child for treatment to their own dentist, so that the principal advance made in France is the establishment of the obligatory dental inspection and chart. Latterly, dental services have been organised in connection with the public relief board. Attendance is given twice a week, though in the hospitals urgent cases receive attention immediately.

As remarked by Mlle. Sommers, "All these innovations are useful, but they are not sufficient to check dental caries on a national basis. In order to render the teeth of the whole community healthy, and to raise the general standard of health, it is necessary to institute school dental clinics."

In Sweden Dr Forberg, by his indefatigable zeal, soon brought the importance of dental hygiene to the knowledge of his fellow-countrymen, and in association with the Swedish Dentists' Society prompt steps were taken.

In 1896 this society appointed a committee, which examined dentally 18,000 school children. The condition of affairs revealed was so serious that conferences were held in the primary schools and in the colleges of the capital; lectures were organised for children, parents, and teachers; large money prizes were offered for the best books dealing with the teeth and oral hygiene; statistics of dental caries were shown at a health exhibition held at Stockholm, and the public journals interested themselves in the question, and insisted that the State should intervene. In 1905 the Parliament took up the question, and soon Stockholm had its school dental clinics.

In Switzerland at the Polyclinic at Lucerne there is a dental department in which all school children without distinction are cared for.

In Belgium two dentists are employed by the town of Brussels. The treatment is absolutely free. The communal schools alone benefit from this service. The number of pupils attending these schools is 12,000. The teaching staff assists the work by lecturing to the children on hygienic care of the teeth and mouth, and the children are required to make abstracts of these lectures in writing. At Antwerp also there is a municipal clinic at which dental services are given free.

In Canada the Education Act was amended in Nova Scotia in 1907 so as to provide for periodic and systematic examination of the teeth of children. The dentists examine without charging for their services. There are no school clinics, and the poorer children receive treatment at the dispensaries and dental colleges.

In Australia supervision of the teeth of school children is just being brought to the attention of the public. In South Australia a paid dentist attends to the wards and neglected children of the State. The medical officer is at present engaged upon the examination of the school children, this including inspection of their

teeth. The Odontological Society of Queensland has approached Government upon the question and has received a favourable reply.

In England the British Dental Association in 1901 appointed a Commission, which examined 10,500 children, of whom 86 per cent. required treatment. A pamphlet was published by the association and distributed to the public. The association also approached the Government with regard to the organisation of obligatory inspection. Dental inspection of children attending public elementary schools is now compulsory in England and Wales, and the question of treatment is being considered by school authorities. Dental appointments have been made by many Poor Law schools, orphanages, and benevolent institutions. In the majority of public schools their administrations arrange for dental attendance on the pupils.

At Cambridge the first school dental clinic was established in the year 1907. It was begun as a private scheme, but has now been taken over by the municipality. Elementary school children are treated free of charge. The clinic is well organised, and everything is done to encourage the children to attend. For extractions a room is placed at the disposal of the school dentist in a hospital, the fillings and other treatment being carried out at the clinic itself.

At Norwich the Board of Education furnishes dental aid to children attending the public elementary schools. The cost of this scheme is not in any case to exceed the proceeds of a farthing rate, and this sanction is limited to two years.

London.—At Bromley a clinic was established in January of this year, restricted to children between the ages of six and eight years. A fee of sixpence per attendance for treatment is paid by the parents, while no charge is made for inspection.

At Deptford there is a clinic sudsidised by the London County Council. A small fee, I understand, is paid for dental treatment.

In the Brixton, South London, clinic Mr Breese has done exceptionally good work, and is most enthusiastic with regard to it. The clinic was financed privately, and no reasonable expense was grudged. The work was begun in January 1910, and children attend on two days a week after school hours.

To come to Scotland. Mr Fisher of Dundee has for years advocated at the meetings of the British Dental Association the care of the teeth of children of school ages.

In Dunfermline the Medical Clinic of the Carnegie Trust has been in operation for several years, and the institution of a dental clinic was first advocated by the former medical officer of the Trust—Dr Bridge—who had become convinced, during the medical inspection of the school children, that attention to oral hygiene was absolutely necessary for the general health of the children. The Carnegie Trust was thus the first to establish a public school dental clinic in Scotland. At first there was much scepticism as to the success of such an institution, but this has been completely falsified by the results.

The clinic was started in September 1910, two apartments, a surgery and a waiting-room, being provided in the old baths. At the present time plans have been passed for a special building to house both the medical and dental clinics.

The present surgery is fitted out with the most modern appliances, so that the work is facilitated in every way. In the waiting-room illustrated papers were supplied at first, but were so quickly destroyed by the children that they were discontinued, and toys of various kinds were substituted.

I have been assisted by two trained nurses of the general medical clinic, and a lady secretary. The presence of the nurses gives confidence to the children, as they get to know them at the school medical inspection and at the medical clinic. The secretary makes all appointments, enters operations, make arrangements for inspection at the different schools, and sends lists with the names of pupils expected each day to the headmasters and headmistresses.

I give 12 hours, or 3 days of 4 hours each per week to the work.

Systematic inspections are restricted to the children of ages from five to ten in the primary departments. The reason for this is that one can then watch the results of treatment as time goes on and as the child progresses in its studies from year to year. Notes of treatment required are entered upon charts, and notification circulars are sent to parents or guardians to intimate the hour at which the children are expected. Moreover, the notification forms are useful, because they give the authority of the parents to do what one thinks necessary, and they have even proved of value when parents interfere with the treatment proposed. If anæsthetics are required for extractions, a special form is sent out.

There is no lack of material, as the following table shows:—

ATTENDANCES AT THE CLINIC FROM AUGUST TO DECEMBER 1911—TOTAL, 1834

	Boys.	Girls.	Total.
August	85	113	198
September . . .	203	344	547
October	139	171	310
November . . .	176	266	442
December	136	201	337
	739	1095	1834

In analysing the total attendances I find there were—

21 at the age of 4 years.
158 ,, 5 ,,
315 ,, 6 ,,
314 ,, 7 ,,
244 ,, 8 ,,
224 ,, 9 ,,
148 ,, 10 ,,
155 ,, 11 ,,
110 ,, 12 ,,
100 ,, 13 ,,
14 ,, 14 ,,
2 ,, 15 ,,
29 age not specified.

Hence most attendances were given by children between the ages of 6 and 9 years.

METHODS OF CONTENDING WITH DENTAL CARIES ON A NATIONAL OR MUNICIPAL BASIS

The evil is thus recognised. How is it to be attacked? The Education Act imposes the duty of inspection of the teeth upon local authorities, leaving treatment optional. Some advocate the establishment of a State Dental Service, and maintain that it would not be detrimental to the profession for the following reasons:—(1) It would provide for a class who never seek the services of the dentist, or when they do so, obtain them at the

expense of the dentist at a hospital under the guise of charity. (2) It would provide for those members of the profession who dislike the commercialism of private practice, or who are especially interested in investigation, or, from other cause, prefer the public service. (3) It would educate the public to the need for and importance of skilled dentistry. (4) It would create in the working classes a demand for skilled treatment in the future, and for a service which would be characterised by cleanliness of method and careful manipulation, and impose upon them from their earliest years the need for oral hygiene. Instead of militating against the demand for skilled and modern methods of conservative dentistry, it would strengthen the position of the best type of qualified practitioners.

The establishment of such a service would, however, require to be safeguarded by some scheme founded upon a contributory basis, and this would probably prove an unsurmountable barrier.

In some of the smaller towns in Germany a fee of 1s. per head per annum is charged for each child treated, with a reduction in the case of large families.

The second manner is that which I have been considering for the greater part of my paper—the school dental clinic. These should be established in every centre of elementary education, thus attacking the evil through the children, as representing the coming generation. Children should be submitted to regular compulsory inspection of their mouths, and caries treated as soon as detected. The necessity for cleanliness of the teeth as preventive of caries should be emphasised. This is not difficult, as even young children can be readily taught to use the tooth-brush.

The inspection should be carried out by a dentist. In New York it was found that examination by medical officers detected only one-eighth of the defects found by the qualified dentist.

Prevention is much less costly than cure, and, as Mr J. G. Turner says, "In a few years the decrease in sickness of dental origin might reasonably be expected to lead to a substantial decrease in poor rates, and to set free for more useful purposes a large amount of charity now used up in attempts to rehabilitate the wrecks of humanity."

Discussion

The President was sure the Society would agree that they were much indebted to Mr Shennan for his practical paper. Although

the medical practitioner "could only recognise one-eighth of the dental disease," he was sure, even recognising that one-eighth, they would be prepared to admit the necessity for something more being done.

Dr William Guy would have preferred to hear some of the medical and surgical members of the Society, and particularly some of those interested in educational matters. He was, of course, familiar with the work which had been done in the matter of dental hygiene, which had formed a very large proportion of the work done by the International Dental Federation; from time to time they received reports from practically all parts of the world on this very important subject.

So far as Scotland, and Edinburgh in particular, is concerned, the matter was not so much one of the advisability of attention to the teeth of school children, because that was a question on which there was no diversity of opinion, but an economic, administrative, and, in these days, to some extent, a political question. The tendency of the day seemed to be that everybody should pay for everybody else—a very agreeable state of affairs for those who are paid for, but not so agreeable for those who have to pay.

In the first instance he would like to put a few questions to Mr Shennan, because if one establishes school clinics in Edinburgh, the cost must be met partly out of the rates and partly out of a grant from the Exchequer.

Mr Shennan attends to 1400 cases in the course of a year, as he gives 4 hours a day for 3 days a week, that is 12 hours a week. Allowing him a fortnight's holiday, which was perhaps not excessive, that comes to 600 hours in the course of the year. Dividing 1400 by 600, it means that he attends $2\frac{1}{3}$ children in every hour, or $9\frac{1}{3}$ children in the 4 hours; roughly he attends to—and one noticed he said no more than attends to—10 children in 4 hours. What did that attention mean exactly? Was one to understand that 9 or 10 fillings are performed by him in 4 hours on an average; or does attendance mean an inspection and the insertion of one of those dressings, which, according to the chart shown, are very numerous in the course of a year? In other words, how many effective permanent fillings and how many permanent teeth are more or less permanently saved in the course of the year? Whether does this 1400 represent 1400 permanent teeth permanently saved—which would be an enormous achievement, but quite

possible—or does it include a large number of merely temporary dressings and attention, such as treatment of gums, abscesses, and preliminary treatment of various kinds ?

Secondly, he would like to know what the total cost of the clinic is—of course he knew it was financed by the munificence of Mr Carnegie, but he would like to know what the exact cost over all per annum is, and what the cost of each effective filling works out at ; because taking Mr Shennan's figures and taking them to mean that 1400 fillings per annum are done, and considering the remuneration, the cost of nurses, premises, etc., he had a strong impression that each effective filling done under these circumstances will not differ greatly from the fee which a reputable dentist would charge for the work were it performed in private.

With regard to the question—Should school clinics be established in Edinburgh ? While he was perfectly certain that the teeth of the children attending the public schools in Edinburgh required a great deal of attention, and ought to be attended to, he was by no means convinced that the most effective and most economical way of accomplishing that end would be by establishing these school clinics. In Edinburgh there is a Dental School where a great deal if not all of the necessary work could very well be performed at a very considerably less cost, he believed, than the same work done in school clinics. One must, too, remember that these children provide, in the centres where there are Dental Schools, a very considerable amount of clinical material, which is absolutely necessary for the carrying on of these schools, and that if the whole of that work is taken away from the schools there will be an ever-increasing difficulty in getting the necessary material for the education of the on-coming dentists. If one provides gratuitous dental treatment in school clinics under such luxuriant conditions as had been shown on the screen, then there was very little doubt that the minds of the children would become imbued with the idea that they were entitled to such gratuitous services, and in later life they would demand the continuance of it and refuse to come to the hospitals, and the teaching of dentistry would therefore be very much handicapped. He agreed, however, that in country districts and towns where there were no hospitals that school clinics were very desirable if they could be established on an economical and semi-charitable basis ; but to establish them on the lavish scale which has been done in this instance and as he noticed the Glasgow School Board

proposes to establish them, he did not approve of. In Glasgow they had received a grant of £900 and had resolved to appoint two men, to work three hours a day, at a salary of £250 each, a nurse at £60, and rent for premises at £175. That he considered a very lavish and useless scale; he was quite certain that in towns where there are dental hospitals, by the payment of a small sum the work could be done as well, possibly better, for very much less money. But he was entirely open to be convinced to the contrary if it could be shown that these clinics could be established and really cope with the amount of work at a reasonable expenditure.

Dr James Ritchie was very much interested in the subject. They were, he thought, in the first place, much indebted to their secretaries, and, in the second place, to Mr Shennan for the paper they had just heard. On the principle that prevention is better than cure, he thought the members of this Society might do much to help in the prevention of caries. Mr Shennan mentioned the case of a boy who had very good teeth who lived on crusts. Dr Ritchie believed that the great prevalence of caries was due to the food—too much soft food—which was eaten; if they could get people to eat biscuits and hard food there would be less caries. As Medical Adviser to a large boys' school for the past twenty-five years, and since the Education Board demanded the regular inspection of children at certain fixed dates, he had had to examine the physical condition of a large number of children, and was very much astonished to find the things requiring most care were, in order (1) the teeth, (2) tonsils and adenoids, (3) enlarged glands, (4) the condition of vision, and (5) the scalp. He had not the exact figures with him, but 80 per cent. of the boys had carious teeth. Unfortunately, whereas the inspection is compulsory, the treatment is optional; and on the second examination of the boys, which took place two years later, on entering the higher grade, he found that in a large proportion nothing had been done. Reports had been sent to the parents, but the doctor has nothing to do in seeing that the treatment is carried out. It was interesting to find that in those boys who had had their teeth properly attended to, the condition of the tonsils and glands was very much improved—the tonsils smaller and the glands smaller, while in those who had had nothing done the tonsils and glands had not improved and were in some cases worse. The unhealthy look of the boys whose teeth were in an unsatisfactory condition had also

struck him. The subject was one of very great importance in its bearing on the health of the boys. At the speaker's suggestion the head-master called the boys together and for ten minutes gave them some practical hints on the care of the teeth; that was repeated, and he believed was of some advantage to the boys, because at a subsequent examination it was found that more had been taking care of their teeth.

Instead of having special clinics established, he should hope that existing institutions might be able to undertake the work.

Dr W. Macrae Taylor, in view of what Dr Ritchie had said, wished to add a word on the subject of prevention. There is no doubt that most medical men consider the question of caries of the teeth of very serious import. Not only amongst the ordinary school children, but amongst the better working-class adults the teeth are in a most appalling condition. When Mr Arnold Foster was Secretary for War, an edict went out that all volunteers were to be examined medically with the view of fitness for foreign service; Dr Taylor examined 300 of these men, aged from 17 to 30, and out of the 300 there were only 6 who had a really good set of teeth, the great majority were in an appalling state. The idea is to let the teeth go on till they are just as bad as possible and then get an artificial set if they can afford it. These people are almost beyond legislating for! A couple of weeks ago there was a Conference in London dealing with diet in schools, and Dr Sim Wallace read a paper on the prevention of caries. He said, as Dr Ritchie said, that caries is due to unsuitable food, that what causes caries in children's teeth is soft, sweet food—bread and jam and cocoa at the last meal of the day—and if they had that sort of food they should end the meal with something hard or fibrous, such as a hard biscuit or an apple.

In the Preparatory School with which he (Dr Taylor) was connected the boys were of a very good class, where the teeth are cared for, but where the brushing is neglected, as little boys are apt to do. He had also discovered that the Matron, who is a very kind-hearted person, used to go round the dormitories and tempt the boys to get quickly into bed by giving them a sweet, usually a chocolate, after they got into bed. That is the worst thing that could be done. The brushing of the teeth should be the last thing. An order has now been given that no refreshment of that sort is to be given, and the brushing of the teeth is to be the last thing at

night. He thought as medical men they could do a great deal to encourage people to carry out certain simple arrangements of that kind and so prevent caries in young children. They were very much indebted to Mr Shennan for his paper, because unfortunately dentistry is becoming so much a specialty that the medical practitioner is very apt to overlook it, and it was good to be reminded of it.

Dr Stewart Fowler said although Dr Macrae Taylor had alluded to the subject, he would ask Mr Shennan if he would state in a few words what sort of food was best for the prevention of dental caries in young children. One read a great deal about abstaining from soft food, but in practice it was difficult to map out a diet to be followed.

Dr Theodore Shennan said Dr Guy seemed to assume that the knowledge of this dental caries in children is well known; personally he had no idea of it until he began to talk the matter over with his brother. He thought it would be very useful if men in the position of Dr Guy would give them some information with regard to these things, which are so useful for the practitioner in his general work. He would also like to hear some points of practical importance in connection with the pathological changes occurring in the jaws; for example, as to whether inflammatory changes about the jaw while the primary teeth are in position have a distinct influence on the permanent set. Then there is the question of food; and another thing to be remembered is that all teeth are not made of the same substance, that seemed to be the great difficulty, and one style of food may be perfectly harmless in one case, while in others it may do harm. In certain quarters, he believed, there was a movement on foot to do away with the tooth-brush, on the view that it is not necessary, on the basis apparently that because some children have perfect teeth without the tooth-brush, therefore it is not of any use. It reminded one of the question of bovine tuberculosis—some people said that because certain families could take such milk with impunity, therefore all families could, which is, of course, nonsense.

In connection with the question of food he believed that the higher priced chocolates were most pernicious on account of the waxy-like material which they contain, which sticks about the teeth, and which also collects along the intestinal tract and interferes with digestion.

No doubt caries of the teeth had an influence on tuberculosis, although no one could say that the infection emanated from a tuberculous tooth.

An interesting point was the formation of habit spasms—not epilepsy. Perhaps some of the physicians to the Sick Children's Hospital might know something of that; these attacks could be cured by attention to the teeth.

Dr Leebody felt that he had got the chance of his life in meeting the dentists, and would ask one question. Many a time he had sent in cases of caries and had had them sent back with the message that the dentist would not take out the teeth on account of harming the jaw. In the light of what they had just heard that did not seem right. He had actually sent in a patient with a threat that if the dentist did not deal with it he would deal with it himself. Is there any advantage in keeping bad teeth in the mouth for an indefinite period in a young child because of injury to the jaw from having them extracted? That was the point he would like settled.

Dr James Smith said he was there to represent Dr Meikle, the School Board Medical Officer, who asked him to come and listen as he himself could not be present. After reading a number of statistics from Dr Meikle's report, Dr Smith said that most of them no doubt knew that some £600 would fall to be distributed for the treatment of children. Supposing that sum was divided equally amongst eye defects, ear defects, and teeth defects, they would have somewhere about £200 to set up a clinic. He was fortunately in time to see the last picture shown by Mr Shennan, and if they were to establish a school clinic such as that, and pay for the dentistry work, etc., with only £200 they would have to fall back on the rates. They on the Edinburgh School Board knew that they would have to confine this treatment to the necessitous children, just as they had to do in feeding the children; beyond that, he thought he was safe in saying they had no right to go. As regards the feeding of children, it was said that in the case of the necessitous child they would be able to fall back on the parents and compel them to pay; they had not yet had to compel any parent by law to pay.

Dr Smith felt very much in connection with this subject as he did on the subject of tuberculosis, namely, that if one takes all the children to a clinic, there will not be sufficient material upon which

to teach the dental students ; and if one is going to institute large sanatoria and dispensaries, the tuberculous cases will be entirely confined to them, and there will not be sufficient material for teaching purposes.

Mr J. H. Gibbs said the subject was so large that in a few words it was impossible to do justice to it. The question of treating school children was becoming of very great importance. There was no doubt that if the ratepayers have to pay, the subject is brought before the laity. Before embarking on clinics or any other expensive ways of "playing," for he could not characterise it as anything else, he thought they must look to the matter very carefully.

n telephoning that afternoon to the School Board Offices he had found that there were 50,000 children in attendance. Mr Shennan spoke of the extent of caries per head, and he gives it at 80 or 90, possibly in certain individuals 70 per cent. That is not the point, the question is the number of decayed teeth to be dealt with. In Great Britain it amounts to more than 90 per cent. of the teeth. There is no question that there are millions of decayed teeth to be treated in this country. Supposing all the dentists—some 150—in Edinburgh were to work together for long hours a week on the school children, they could not overtake the work. That was his opinion, and therefore that being impossible, the great problem arose—What were they to do ? They would have to join hands with preventive medicine and try and prevent caries. It has been proved quite conclusively that caries is preventable. Every one knew that in what are called native races—Indians, Chinese, Maoris, and North American Indians—the percentage is less than 5 ; in European races and Americans it is 95. There is no doubt that caries is increasing very much at the present time, and that it has accompanied a change in diet—a soft diet and an enormous increase in sugar. Some people were bringing up children in the belief that caries is preventable, but they were heterodox. He was not going to say that the tooth-brush was of no use, but in a child in rags and tatters, who had probably come on account of a slightly carious tooth, the teeth would be found to be perfect, while in better-class children who used a tooth-brush, tooth powder, mouth-washes, and so on, the teeth were very often bad. In that case some people would say, Do away with the tooth-brush and prevent caries. There

was no better mouth-wash than a normal saline. Chocolate is the worst thing, and, as Dr Shennan pointed out, the better the chocolate the worse it is for the child. Sometimes one read books on dietetics which made one rather sceptical, and some examples from the book of an Edinburgh man who professed to be an authority illustrated this point. Those anxious to prevent dental caries would prohibit the use of sweets, but patients and their friends often say the doctor said the sweets were good for them and they were to have them.

In order to prevent dental caries the medical men must first be educated and through them the public. They must realise that the harm is done before the patient ever comes to the dentist, and that the whole thing is preventable by simply altering the diet.

The first thing is to get out of the average doctor's head that when the child is weaned it should be put on milk, mashed potatoes, and gravy. The child ought rather to be put on hard dry food, to be put on bones. In the case of his own child, after they had got all the meat off the bone the child got it, and is never happier. Milk, crusts with plenty of butter, and fat ham are the chief foods; and even at this early stage he gets lots of oranges. Sweets in any shape or form are prohibited, and if children are not given sweets they have no craving for them; just as in the case of adults, if never given alcohol there will be no craving for it. If a small piece of cake is given occasionally, he ends up with omething that will scrape it away. No jam, or, if any, it is given at the beginning of the meal and something given later, especially an acid—as for example the acids in fruit.

Mr Shennan in reply said in order to answer all Dr Guy's questions he thought he would require to write another paper. The attention includes inspection, dressings, extractions, and fillings. He had mentioned one clinic where the patients were charged a shilling per annum.

Dr Guy asked what was the actual cost of the completed work.

Mr Shennan said, it being a private clinic, he was not at liberty to give details, but, as he had said, in one instance a charge of one shilling per head per annum was made.

Dr Guy remarked that it would not work.

Mr Shennan.—As to Dr Fowler's question about food. He did not, of course, pretend to do anything about that, but always recommended that the food should be as rough as possible and take plenty of mastication. The teeth were there for the purpose of being used, and soft food did not give them the proper amount of work. In the treatment of temporary teeth, he approved of retaining those which are free from abscess and filling them just as permanent ones, in order to make them valuable as long as possible for mastication.

TWO CASES OF SEPARATE ACROMION PROCESS, WITH A NOTE ON THE APPEARANCES PRESENTED IN RADIOGRAPHS OF THE ACROMION PROCESS AND UPPER END OF THE HUMERUS DURING OSSIFICATION

(*With Lantern Demonstration*)

By J. W. Struthers, F.R.C.S., Assistant-Surgeon, Royal Infirmary, Edinburgh

Although at first sight the ossification of the acromion process would not appear to be of great interest from the clinical point of view, it has nevertheless been the subject of close investigation by surgeons as well as anatomists, and the appearances presented have given rise to considerable discussion. As will be remembered, the base of the acromion process is ossified along with the spine of the scapula at an early age, while the tip remains cartilaginous till between the 14th and 16th years. About that time bone begins to be deposited in the tip of the acromion from a number of separate centres which finally coalesce, and the completely ossified tip, or epi-acromion, remains separated from the base of the process by a cartilaginous epiphysial line until growth is completed, at or before the 25th year.

Controversy has chiefly turned on the point as to whether this epiphysial line ever remains unossified or not.

In the post-mortem and dissecting-rooms, cases are not infrequently found, in adult subjects, in which the epi-acromion is separated from the base of the process along a line which corresponds to the position of the epiphysial line during the period of growth. This line corresponds also to the usual site of fracture of the acromion process, a not uncommon accident.

Some have maintained that the separation is always the result

of fracture with non-union, while others believe that it is due to the persistence of the epiphysial line. A strong argument in favour of the latter view, though not a conclusive one, is the fact that the condition is frequently bilateral. In 1895 the late Sir John Struthers published an account of a number of specimens of separate acromion process found in the dissecting-room, and after reviewing all the evidence available at that time, concluded that the condition was probably always traumatic in origin. Cases of bilateral separate acromion process were, he believed, to be explained by the occurrence of injury, not necessarily synchronous, to both shoulders. At the period at which he and others wrote investigation was necessarily confined to the post-mortem and dissecting-rooms, and the clinical histories of the cases found could not be ascertained to throw light on the matter.

Thanks to the revelations of the X-rays we are now in a position to observe the acromion in the living subject, and I have recently been fortunate enough to obtain radiographs of the shoulder in two cases which show a separate epi-acromion in healthy and uninjured joints.

The first case was that of a miner, aged 40, who was struck by a fall of coal and thrown violently against a beam in such a way that he struck the edge of it with his right shoulder but was otherwise uninjured. He was admitted to the Royal Infirmary some weeks later on account of persisting disability of the shoulder, and was found to have sustained a fracture-dislocation of the humerus. The head of the bone had been broken off at the anatomical neck and was lying in the axilla. The radiograph also showed that the acromion process had apparently been injured, as there appeared to be a crack running across it just behind the facet for the acromio-clavicular joint. A radiograph was then taken of the uninjured left shoulder for comparison, and this showed clearly a persistent epiphysial line in the acromion process (Fig. 1). The patient, fortunately, was able to give a perfectly definite account of his accident and previous history, which left it beyond doubt that he had never sustained any injury to the left shoulder. The line seen in the radiograph of the acromion corresponds exactly with that of the epiphysial line seen before ossification is complete.

The second case was that of a miner, aged 50, who had sustained an injury to the left shoulder and hand, resulting in dislocation of the humerus and wounds of the hand. He was

FIG. 1.

FIG. 2.

PLATE 6.—TO ILLUSTRATE ARTICLE BY MR J. W. STRUTHERS.

admitted to the Royal Infirmary nine weeks later on account of persistent stiffness of the injured shoulder. A radiograph showed osteoarthritic changes following the injury, along with what appeared to be a separate acromion process. The uninjured shoulder was consequently radiographed for comparison, and showed, as in the first case, a persistent epiphysial line (Fig. 2). The joint was healthy, and had never been injured.

The presence of this condition in two well-developed muscular males, aged respectively 40 and 50 years, who were both able to give a clear history that the shoulder showing the abnormality best had never been injured, is good evidence that the condition, in some cases at any rate, is due to anatomical abnormality and not to injury.

The finding of the condition during life, in patients who could give a clear history, supplies the link in the chain of evidence which was wanting to those whose observations could only be made in the dissecting-room. Separate acromion process is so often found in the course of dissection that, on the assumption that it is always due to injury, some have asserted that although often overlooked clinically, fracture of the acromion is one of the commonest of all fractures. The evidence afforded by the use of the X-rays has not supported this contention. On the other hand, the close correspondence in the position of the usual line of separation with that of the epiphysial line during growth, taken with the fact that this separation is found in adult life, apart from injury, would seem to make it probable that the majority of cases are due to non-union of the epiphysis.

The writer has had a series of radiographs taken in order to show the appearances presented at different ages by the ossifying acromion process These appearances coincide with the description usually given in the text-books, except that they show ossification to be complete at an earlier age than that usually given, as the two cases above noted are the only examples found showing a persistent epiphysial line after the 20th year. The number of cases examined so far is, however, not sufficient to enable a positive statement to be made as to the average age at which ossification is really complete

In taking radiographs designed to show the acromion process, the best results are got if the patient is placed in the usual position for a radiograph of the shoulder, *i.e.* on the back, with the shoulder region lying on the plate and the tube in front.

The tube should be centred about the junction of the anterior fold of the axilla with the arm. If it is centred higher the rays strike too much in the plane of the acromion process, with the result that its whole extent is not well shown, and the presence of a crack or persistent epiphysial line cannot readily be detected.

Owing to the irregular manner in which bone is deposited from several centres in the epi-acromion, appearances are often presented which closely resemble the results of disease or injury, and great care is necessary in interpreting radiographs taken during the period of growth. Both sides should always be examined before arriving at a conclusion, and care be taken that the limbs to be compared are radiographed in an exactly similar position.

That radiographs of a joint in slightly different positions may show strikingly different appearances is well known but sometimes not fully appreciated. This is especially true when epiphysial lines are present to complicate the picture. Figs. 3 and 4, representing the right shoulder of a boy of 13, illustrate this point well. Fig. 3 shows the picture presented when the shoulder was taken from the front, with the humerus placed so that the greater tuberosity looked directly outwards. The conical shape of the upper end of the diaphysis, the contour of the epiphysial line, and the greater tuberosity are well seen. Fig. 4 shows the picture when the humerus was rotated in with the forearm across the chest so that the greater tuberosity looked forwards instead of outwards. The epiphysial line now appears to be doubled, and this appearance is apt to be, and in the writer's experience actually has been, mistaken for the result of injury, one line being regarded as the epiphysial line, the other as a fracture. This double contour is always seen, with a varying distance between the two lines, in any humerus radiographed in internal rotation, before ossification is completed. The radiographs also show the appearance of the acromion before ossification has began in the epi-acromion.

In conclusion, the writer has to thank Mr C. W. Cathcart and Mr J. W. B. Hodsdon for having kindly allowed him to examine and make use of the two cases referred to above as showing separate acromion processes, and Drs Hope Fowler and M'Kendrick, of the Electrical Department in the Infirmary, for their courtesy in allowing him to work in their department, as

Fig. 3.

Fig. 4.

Plate 7.—To Illustrate Article by Mr J. W. Struthers.

well as for much assistance in taking and examining a large number of radiographs.

The President said the Society was very much indebted to Mr Struthers for his extremely interesting, useful, and practical paper, and they would be very glad to hear any remarks if anyone will promise not to be too long.

Mr David Wallace thought it would be a great pity if some one did not congratulate Mr Struthers on his most excellent and also most valuable demonstration. Every day one has to look at radiographs and had considerable difficulty in interpreting them, and seeing such a series must be of great assistance in the future. He (Mr Wallace) had for many years been interested in this persistence of the epiphysis of the acromion process, ever since indeed Sir John Struthers showed him the specimens to which Mr Struthers referred, and told him he had brought them to Edinburgh because they were too valuable to leave in Aberdeen; he had also heard him read the paper before this Society. In the Surgical Museum of the University Mr Struthers would possibly see two specimens of an arthritic condition associated with trauma. At the time he was particularly interested in this subject, a surgeon, whose name he had forgotten, said the most common accident was fracture of the acromion, and his interest was renewed when the fracture he spoke about was shown to be a persistent epiphysis. He did not think it a point of practical importance, but it was very interesting and Mr Struthers had done much to elucidate it.

Mr Struthers replied that he was familiar with the specimens which Mr Wallace mentioned. It was Mr Arbuthnot Lane who wrote the paper many years ago and maintained very dogmatically that this was always traumatic. The whole thing turns on getting the history and seeing it on the living subject. It is not always traumatic, and more than that one is not entitled to say.

REFERENCE.—Struthers, *Edin. Med. Journ.*, 1895-6, p. 289.

Meeting IX.—July 3, 1912

Mr J. M. Cotterill, *President, in the Chair*

I. Exhibition of Patients

Dr Lovell Gulland showed—

(*a*) Case of LYMPHADENOMA. Man, aged 26.

Seven months ago first noticed small lump low down on left side of neck; grew steadily in size. Two months later swellings began to appear on right side. Very shortly after, similar swellings in both axillæ. Evidence of large intra-thoracic growth also. Four months ago grew rapidly larger. Dyspnœa and spasm.

Admitted April 27th. Gland excised—definitely lymphadenomatous. R.b.c. 3,700,000. Hb. 70. W.c. 32,200. P. 86. L. 3. M. 11.

Liq. arsenicalis for 10 days; no change. .6 grm. salvarsan on 8.5.12. Glands smaller. Leucocyte count lower.

In a fortnight as bad as ever; second dose, .6 grm. salvarsan; marked reaction and symptoms of arsenical poisoning; glands growing rapidly; dyspnœa much more marked. Has now again improved.

(*b*) Case of STOKES-ADAMS SYNDROME with apparently permanent heart-block.

Man, aged 76. In army 11 years, then brass-finisher. Six years ago first seizure, sudden dizziness while walking along the street—lasted quarter of an hour, no unconsciousness. No more fits until end of May. Became dizzy and lost consciousness. On coming to, found himself on the floor with right arm up against gas-stove, badly burned. Pulse-rate averages 36, with evidence of complete heart-block.

II. Original Communications

1. VAGUS STIMULATION AND PARESIS IN THE TREATMENT OF CARDIAC IRREGULARITIES

By W. T. Ritchie, M.D., F.R.C.P.

Although many disorders of the heart's action that were formerly ascribed to some primary disturbance of the cardiac innervation are now usually regarded as originating in the heart muscle itself, it is beyond doubt that in accordance with the demands made upon the heart muscle for work its contractions are controlled and

modified by means of the accelerating and inhibitory nervous mechanisms. Further, we know that disturbances of cardiac innervation may be revealed by abnormalities in the rate, rhythm, or strength of the heart's action. In the observations which I have to offer, I shall limit myself to a consideration of the inhibitory impulses passing to the heart by the vagus nerve.

In animals the action of the vagus on the heart is most conveniently studied by observing the changes that ensue upon faradic stimulation of the vagi in the neck, and those that result from section of the vagi. By stimulation of the right vagus pronounced inhibitory effects are occasioned. The rate, excitability, and tone of the auricles become lessened, their beats are weakened, the duration of auricular systole is lengthened, and stimuli pass more slowly through the auriculo-ventricular bundle to the ventricles. When the vagus control is abolished by cutting the vagi in the neck of the cat or other mammal, the auricular beats become quicker and stronger, and stimuli can pass more rapidly from the auricles to ventricles. Whether the vagi have any direct action on the mammalian ventricles is still a matter of controversy, but all the available evidence indicates that if the vagi have any direct influence on the ventricles it is very slight as compared with that exerted indirectly on them through the auricles.

Working in the Clinical Medicine Research Laboratory of the Edinburgh Royal Infirmary, I have ascertained that the effects produced on the human heart by digital compression of the vagus in the neck are closely comparable to those of vagus stimulation in the lower mammalian heart, and that the effects of atropin on the human heart are similar to, although of lesser degree than, those following section of the vagi in animals. The most striking and constant effects of compression of the right vagus in man are slowing of the whole heart and weakening of the auricular beats. In nearly every instance I found that the right vagus was more effective than the left. As less constant effects we observe that the duration of the auricular beats may be prolonged and the conduction of stimuli to the ventricles impaired. When the ventricular beats under vagus stimulation become slower they usually become stronger, but in exceptional cases they are weakened. Bilateral compression of the vagi must be regarded as somewhat dangerous, for in the case recorded by Thanhoffer it caused an epileptiform seizure. A prolonged, firm compression of the right vagus might conceivably induce the same effect. But in all my

observations, with few exceptions, only one vagus was compressed and not for more than four or five seconds, and the patients did not experience any disquieting or alarming symptoms.

The inhibitory effects of the vagus on the heart may be induced in other ways than by compression of the nerve in the neck. The inhibition may be due to increased intra-cranial pressure, as for example the slow, irregular pulse of tuberculous meningitis. Firm pressure applied to the abdomen may sometimes cause slowing or transient arrest of the heart's action. The retardation and greater amplitude of the pulse during prolonged, deep expiration are mainly reflex vagus effects. Moreover, the action of drugs, such as digitalis and strophanthus, although partly a direct one on the cardiac musculature, is partly an indirect one by stimulation of the vagi. These drugs slow the heart, strengthen the ventricular beats, and depress the conductivity of the auriculo-ventricular bundle; and pharmacologists hold that in small dozes these drugs depress the excitability of the heart muscle just as faradic stimulation of the vagus does. If these drugs, in stimulating the vagi, do weaken the auricular beats and lower the tone of the auricular muscle, this harmful and undesirable action would appear to be more than counteracted by the beneficial effects of the slower and stronger ventricular beats.

As we know that the inhibitory effects of the vagus are exerted mainly on the auricles, all morbid conditions in which the auricles are beating too rapidly should be influenced beneficially by therapeutic measures which tend to stimulate the vagus. Let us first consider the condition when the heart's action is excessively rapid and easily perturbed, although there is no recognisable valvular lesion. In such a case we make a preliminary test by directing the patient to take several deep inspiratory and expiratory movements. If the pulse lessens in frequency and increases in amplitude during deep expiration we have evidence that measures directed to increase the action of the vagus should be useful in checking the tachycardia. In other cases of similar nature we may find that although deep expiration was not accompanied by any notable retardation of the pulse, yet its rate can be retarded by vagus compression, and in these cases some measure that will lead to increase of vagus control over the heart is likewise indicated. In many cases of this nature excellent results may be obtained by digitalis or strophanthus administered in small doses over a period of weeks or months. In other instances the patient may derive undoubted benefit from

breathing exercises performed carefully, and under competent supervision if necessary.

In cases of rhythmic tachycardia dependent on a valvular lesion and advanced cardiac failure, vagus compression may be wholly ineffective, and the subsequent administration of digitalis and strophanthus may likewise prove incapable of slowing the heart. A preliminary vagus compression test may thus assist us to estimate approximately the probable benefit to be derived from those drugs. But failure to respond to vagus compression does not necessarily imply that the drugs of the digitalis group will prove wholly ineffective, for the latter may do good in virtue of their direct action on the heart muscle.

In paroxysmal tachycardia vagus compression may occasionally cause slowing of the heart. Deep respirations, swallowing movements, and intravenous injections of strophanthin may be tried with the same object, but all may fail. I recall one case with a maximal pulse rate of 222 per minute, in which even firm bilateral vagus compression wholly failed to arrest the paroxysm.

Physiologists tell us that vagus stimulation depresses the excitability of the auricles. Vagus stimulation, therefore, ought to prove beneficial in all conditions of auricular hyperexcitability, namely in cases presenting extrasystoles of supra-ventricular origin and in cases of auricular fibrillation and of auricular flutter; and atropin, cutting off the vagus influence, ought to prove harmful. I have, however, not observed any case in which vagus compression could be said definitely to check or abolish extrasystoles. Both ventricular and supra-ventricular extrasystoles may continue to occur with unlessened frequency during the period of vagus compression. In some patients digitalis and strophanthus likewise fail to arrest the production of extrasystoles. Moreover, in some cases of auricular fibrillation these drugs undoubtedly promote the onset of ventricular extrasystoles, and when the administration of the drug is continued the extrasystoles may recur with such frequency that a continuous coupled rhythm of the ventricles is induced. In such cases the extrasystoles are usually abolished while the heart is under the influence of atropin. As a rule the only cases in which the administration of digitalis is frequently followed by the disappearance of extrasystoles are those with cardiac failure as a result of mitral, or aortic and mitral, lesions. In these cases the restoration of the pulse to complete regularity is coincident with the disappearance of the dyspnœa, cyanosis, œdema, and other

manifestations of heart failure, and may therefore be due to other factors than mere depression of excitability by vagus stimulation.

When the excitability of the auricles is greatly increased, as in the condition of auricular fibrillation, neither vagus compression, digitalis, nor strophanthus arrest the fibrillar contraction. In experimental work indeed weak vagus stimulation promotes the onset of fibrillar contraction. But in clinical work we know that all measures directed to stimulate the vagus are as a rule of benefit to patients suffering from auricular fibrillation. The benefit is obtained by an effect, not on the auricles, but on the auriculo-ventricular bundle. The drugs depress the conducting power of the bundle and thus to some extent shield the ventricles from the constants hower of auricular stimuli, so that the ventricles, previously contracting irregularly and rapidly, now beat with a slower although still irregular rhythm. The lengthening of diastole gives the ventricular muscle longer periods of rest, and its contractions become stronger.

While a large proportion of heart cases present indications for vagus stimulation, it is comparatively rare to find patients who derive benefit when the vagus influence is diminished by means of atropin. In the great majority of cases presenting extrasystoles it is neither necessary nor desirable to institute any treatment, whether by atropin or otherwise, for the irregularity itself. If the irregularity is associated with chronic myocarditis or with a valvular lesion, digitalis rather than atropin is indicated. It is only to patients in whom the conductivity of the auriculo-ventricular bundle is materially depressed, and who consequently exhibit a certain degree of heart-block, that atropin can be administered with any real benefit. If the bundle has been completely severed atropin cannot restore its continuity and therefore cannot do any good to the patient. But if the failure of conduction power on the part of the bundle is not complete but only partial, so that the ventricles are beating irregularly at a rate of about 40 or 50 per minute, we know that the conduction power, in many instances at least, can be improved by means of atropin; and the patient may be decidedly better while his heart, under the influence of atropin, is beating rhythmically at a normal rate. Further, if in such cases of partial heart-block there be any tendency to the Adams-Stokes syndrome, atropin is the best of all drugs to administer. At the same time attention should be directed to the

avoidance or removal of all conditions, such as digestive disorders, which might excite reflex stimulation of the cardio-inhibitory fibres of the vagus.

Lastly, a few words on the treatment of patients presenting the most grave of all cardiac irregularities, the pulsus alternans. Here we are dealing with a seriously enfeebled heart in which the contractility of the ventricles is so much depressed that the rhythmic pulse beats are alternately smaller and larger. Alternation results essentially from organic changes in the myocardium, not from disturbance in the cardiac innervation, yet all nervous influences which cause the heart to hurry tend to make a latent alternation manifest. Atropin is therefore distinctly contra-indicated. Further, we know that faradic or mechanical stimulation of the vagus may weaken the ventricular beats, and Mackenzie has said that digitalis may aggravate the pulsus alternans. But I do not believe that digitalis is harmful in all cases of alternation. Wenckebach maintains that the drug may be decidedly useful, for in slowing the heart it may strengthen the beats and also lessen or even abolish the alternation. Two cases illustrating this result may be mentioned. One, a man aged 55, suffering from aortic and mitral incompetence, with dyspnœa and with œdema of the feet, had an alternating pulse with a rate of 90 per minute. Three weeks later, after he had taken about 200 drachms of infusion of digitalis, his pulse was beating rhythmically 76 times per minute, the alternation had disappeared entirely, and he had recommenced and felt perfectly able for his work entailing severe physical exertion. He then ceased to take the digitalis. Six weeks later the œdema had recurred, his pulse was 103 and again alternating ; but the rate fell to 88, and the alternation vanished in three days, during which period the patient took 40 drachms of infusion of digitalis. The improvement, however, was not long maintained, and death occurred within a few weeks. In the second case to which I would refer, an elderly patient, with a failing heart and anginous attacks, had a pronounced and continuous pulsus alternans. Digitalis, in addition to relieving all the cardiac symptoms, lowered the pulse rate from 118 to 82 per minute, caused the alternation to disappear, and restored the patient to comparatively good health for several months. Thus, in spite of all theoretical objections to the use of digitalis in cases of alternation, on the ground that the drug may still further depress the contractility of the enfeebled ventricles, I hold that digitalis may be of great value in slowing and strengthen-

ing the heart, in abolishing the alternation, and in affording much relief to the patient.

Dr W. T. Ritchie, having thanked the Society for the patient hearing that had been accorded to him, said he could not recollect having seen any case of pure aortic incompetence without heart failure that presented extrasystoles. Extrasystolic irregularity, however, was of frequent occurrence in cases of combined aortic and mitral incompetence. In regard to the subsequent history of cases in which a heart-block had yielded upon the administration of atropin, he had been unable to retain most of those cases under prolonged observation. In some the block had been merely transitory and had passed off without the atropin being continued. In others the block recurred after atropin was discontinued; and sooner or later the block might become complete and permanent. One case of this nature that had been under the speaker's care subsequently developed aphasia and hemiplegia from a cerebral hæmorrhage. The patient was admitted to Dr Gibson's ward in the Royal Infirmary, and was afterwards sent to the Longmore Hospital, where he ultimately died.

The effects that had been described as resulting from compression of the vagus were undoubtedly due to vagus stimulation and not to any other factor, such as compression of the great vessels in the neck. In man, compression of the right vagus was more effective than that of the left; and when the vagi could be exposed, as in animals, faradic stimulation of the right vagus was likewise the more effective. The effects obtained by compression of the right vagus are closely similar to those obtained in the dog and cat by vagus stimulation. The slowing of the heart, the strengthening of the ventricular beats, and the heart-block that may be induced by digitalis and strophanthus in suitable cases, are results strictly comparable to those obtained by vagus stimulation.

INDEX

Acromegaly, case of, shown by Dr G. H. Gibson, 162.
Acute myelocythæmia, associated with osteosclerosis, original communication by Dr Alexander Goodall, 141.
Andrew, Dr James, obituary notice, 11.
Antipyrin rash, case of, shown by Dr Norman Walker, 3.
Arthritis, acute, case of, shown by Mr J. W. Struthers, 162.

Bell, Dr Joseph, obituary notice, 9.
Bladder, extroversion of, case shown by Mr Francis M. Caird, 50.
Bramwell, Dr Byrom, delivers valedictory address, 4.
reads paper on tabes with severe gastric crises, 13.
shows case of hysterical contracture of hip, 50.
tabes, 51.
Bramwell, Dr Edwin, showed case of myotonia atrophica, 161.
Bruce, Dr Alexander, obituary notice, 11.
Bryce, Dr William Henderson, elected member, 19.

Caird, Mr F. M., read paper on treatment of tuberculous peritonitis in adults, 86.
showed case of dysentery, 50.
entero-vesical fistula, 85.
extroversion of bladder, 50.
Calculus, patient after removal, shown by Mr Charles Cathcart, 83.
Cathcart, Mr Charles W., elected *Vice-President*, 1.
read paper on treatment of simple fractures, 120.
showed case of cerebral deplegia, 162.
deformity in hip, 162.
fracture of humerus, 84.
gall-stone, 139.
with results after fracture, 51.
Cellulitis, case of, shown by Dr Henry Wade, 52.
Cerebral deplegia, case of, shown by Mr Charles Cathcart, 162.
Chiene, Mr George, showed case of fracture of the shaft of the femur, 51.
Cotterill, Mr J. M., elected *President*, 1.
showed case of sarcoma, 140.

Death roll, 7.
Dowden, Mr J. W., elected *Treasurer*, 1.
Dysentery, case of, shown by Mr Francis M. Caird, 50.
chronic tropical dysentry, treated by short-circuiting, shown by Mr Alexis Thomson, 3.

Eason, Dr John, showed case of gout, 49.
symmetrical liptomatosis, 20.
specimen of gout, 20.
Entero-vesical fistula, case of, shown by Mr Carew, 85.

Fowler, Dr J. S., elected *Secretary*, 1.
Fowler, Dr W. Hope, read paper on orthoradiography of the heart and aorta, 102.
Fracture, after results, shown by Mr C. W. Cathcart, 51.
Fracture of femur, case shown by Mr George Chiene, 51.
Fraser, Dr John, elected member, 52.
Fraser, Sir Thomas R., showed case of hyperidrosis unilateral with syringomyelia, 3.

Gall-stone, case of, shown by Mr Charles Cathcart, 139.
Gibson, Dr G. A., showed case of acromegaly, 162.
of myxœdema, 162.
Glossitis, case of, shown by Dr Chalmers Watson, 20.
Glossitis, specimens from, shown by Dr Chalmers Watson, 20.
Goodall, Dr Alexander, read paper on acute myelocythæmia, 141.
Gout, case of, shown by Dr John Eason, 49.
specimen of, shown by Dr John Eason, 20.
Gray, Dr John Alexander, elected member, 19.
Gulland, Dr Lovell, showed case of lymphadenoma, 184.
of myxœdema, 84.
Stokes-Adams syndrome, 184.
tabes dorsalis, 85.

Hewat, Dr Fergus A., elected member, 52.
Humerus from case of syringomyelia, exhibited by Mr T. W. Struthers, 162.
fracture of, case shown by Mr Charles Cathcart, 84.
Hysterical contracture, case shown by Dr Byrom Bramwell, 50.

Jackson, Dr Hughlings, obituary notice, 7.
James, Dr Alexander, elected *Vice-President*, 1.
read paper on trauma as a factor in disease, 69.
Jardine, Dr Frank E., elected member, 1.

Keith, Dr G. Skene, obituary notice, 8.
Knee-joint from Charcot's disease, exhibited by Mr J. Struthers, 162.

Lipomatosis, case of, shown by Dr John Eason, 20.
Lochhead, Dr James, elected member, 19.
Low, Dr R. Cranston, showed case of xanthoma tuberosum multiplex, 85
Lukoplakia, case of, shown by Dr Dawson Turner, 49.
Lymphadenoma, case of, shown by Dr Lovell Gulland, 184.

M'Kendrick, Dr Archibald, read paper on insufficient data as a cause of faulty interpretation of radiographs, 151.
Mackintosh, Dr Archibald, elected member, 1.
Maclaren, Dr Peter, obituary notice, 10.
Mask for administering chloroform, exhibited by Dr Torrance Thomson, 141.
Mathewson, Dr George D., elected member, 1
Miles, Mr Alexander, elected *Secretary*, 1.
showed result of plastic operations, 52.
Mowat, Dr R. S., elected member, 83.
Muirhead, Dr Claud, obituary notice, 8.
Myotonia Atrophica, case of, shown by Dr Edwin Bramwell, 161.
Myxœdema, case of, shown by Dr G. A. Gibson, 162.
Case of, shown by Dr G. L. Gulland, 84.

Nævus, congenital case, shown by Dr Dawson Turner, 49.
Nephrectomy, case after, shown by Mr Henry Wade, 51.

Œsophagectomy, partial, case shown by Mr Wallace, 139.
Orthoradiography of heart and aorta, original communication by Dr Hope Fowler, 102.
Osteomyelitis, chronic operations for, case shown by Mr Scot Skirving, 161.

Pavy, Dr Frederick W., obituary notice, 8.
Pearson, Dr J. H. H., elected member, 1.
Plastic operation after amputation of finger, case shown by Mr Miles, 52.
for restoration of nose, shown by Mr Miles, 52.
Playfair, Dr John, elected *Vice-President*, 1.

Radiographs — insufficient data a cause of faulty interpretation, original communication by Dr Archibald M'Kendrick, 151.

Rheumatoid arthritis, case of, shown by Dr Chalmers Watson, 50.
Ritchie, Dr James, gives communication on vaccine therapy, 28.
Ritchie, Dr W. T., read paper on vagus stimulation and paresis in the treatment of cardiac irregularities, 184.
Russell, Dr William, read paper on the position of the stomach as a guide to pyloric or duodenal difficulty, 20.

Salvarsan treatment, cases shown by Dr D. P. D. Wilkie, 49.
Sarcoma of radius, case shown by Mr J. M. Cotterill, 140.
Shattuck, Dr Frederick, elected corresponding member, 139.
Shennan, Mr L. Storrow, L.D.S., read paper on the care of the teeth in relation to the health of children at the school ages, 163.
Skirving, Mr Scot, showed case of chronic osteomyelitis, 161.
transplantation of left fibula, 161
Smart, Dr Andrew, obituary notice, 10.
Smith, Dr John, obituary notice, 8.
Specific lesions treated by Salvarsan, case shown by Dr D. P. D. Wilkie, 49.
Specific ulcer treated by Salvarsan, case shown by Dr D. P. D. Wilkie, 49.
Stokes-Adams syndrome, case of, shown by Dr Lovell Gulland, 184.
Stomach, position of, as guide to pyloric or duodenal difficulty, original communication by Dr W. Russell, 20.
Struthers, J. W., read paper on two cases of separate acromion process, 179.
showed case of acute arthritis, 162.
syringomyelia, 162.
exhibited specimens, knee-joint, showing changes in "Charcot's disease," 162.
exhibited specimen, humerus from case of syringomyelia, 162.
Syringomyelia with unilateral hyperidrosis, shown by Sir Thomas R. Fraser, 3.

Tabes dorsalis after operation, case of, shown by Dr Byrom Bramwell, 51.
shown by Dr G. L. Gulland, 85.
Tabes with gastric crises, improved by section of posterior nerve-roots, original communication by Dr Byrom Bramwell and Mr Alexis Thomson, 13.
Teeth, the care of, in relation to the health of children at the school ages, original communication by Mr L. Storrow Shennan, 163.
Thomson, Dr James T., elected member, 52.
Thomson, Dr Torrance, exhibited a mask for administering chloroform, 141.
Thomson, Mr Alexis, communicated paper on tabes with severe gastric crises, 13.
showed case of short-circuiting for chronic tropical dysentery, 3.
ulcerative colitis, 3.
Transplantation of fibula, case of, shown by Mr Scot Skirving, 161.
Trauma a factor in disease, original communication by Dr Alexander James, 69.
Treatment of simple fractures, original communication by Mr Charles Cathcart, 120.
Treatment of tuberculous peritonitis in adults, original communication by Mr Caird, 86.
Turner, Dr Dawson, showed case of congenital nævus, 49.
leukoplakia, 49.
Two cases of separate acromion process, with a note on the radiographs, original communication by Mr J. W. Struthers, 179.

Ulcerative colitis, case of, shown by Mr Alexis Thomson, 3.

Vaccine therapy, discussion on, 52.
original communication by Dr James Ritchie, 28.
Vagus stimulation and paresis in the treatment of cardiac irregularities, original communication by Dr W. T. Ritchie, 184.

Wade, Mr Henry, showed case of cellulitis of leg, 52.
nephrectomy, 51.
Walker, Dr Norman, showed antipyrin rash, case of, 3.

Wallace, Mr David, showed case of partial œsophagectomy, 139.
Watson, Dr A. Pirie, elected member, 19.
Watson, Dr Chalmers, elected *Editor of Transactions*, 1.
showed case of rheumatoid arthritis, 50.
showed specimens from case of glossitis, 20.
Watson-Wemyss, Dr H. L., elected member, 19.
Wilkie, Mr D. P. D., showed cases after Salvarsan treatment, 49.

Xanthoma tuberosum multiplex, case shown by Dr Cranston Low, 85.

Young, Dr James, elected member, 83.

SERIAL

R
35
M55
n.s.
v.31

GERSTS